

SCIENCE

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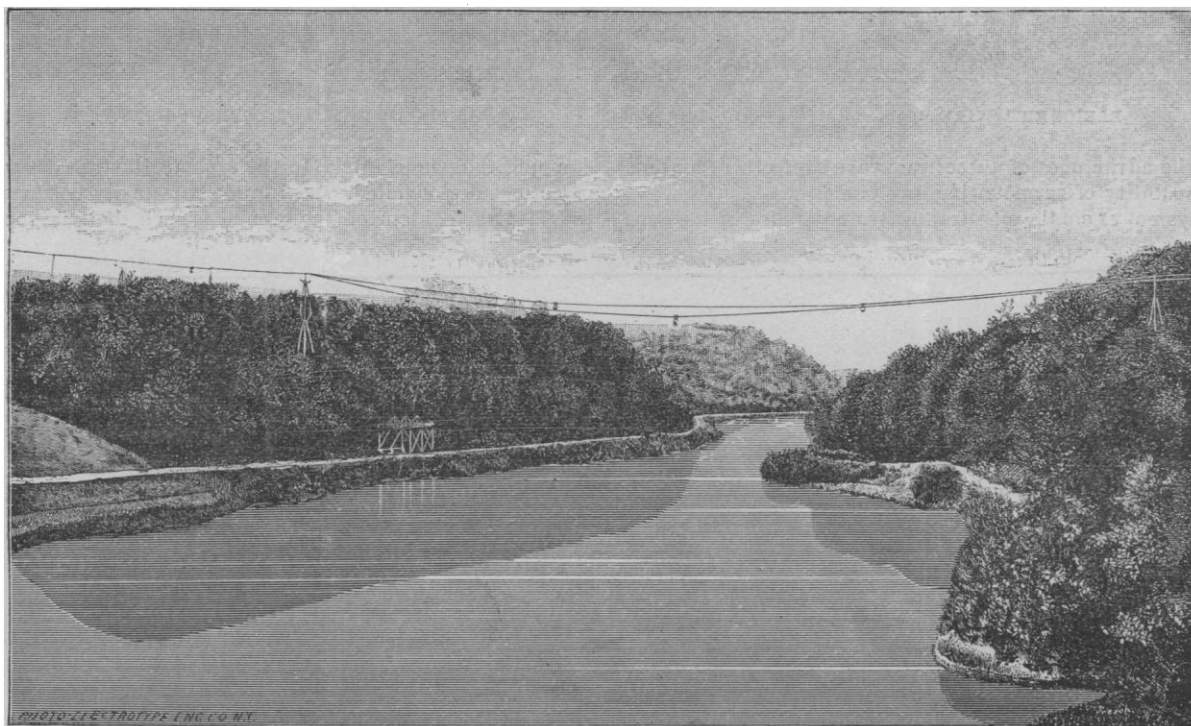
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WIRE-ROPE TRAMWAYS.

WIRE-ROPE tramways, as a means of cheap transportation, are too well known to require any long dissertation on their advantages. As feeders to established systems of railroad or water communication, their low cost of construction through countries where, from the rugged contour of the surface, ordinary railroad or even wagon-road building would be scarcely practicable, except with long and costly détours, has always made them very attractive to the miner and quarryman, to whose use in this country they have been heretofore almost exclusively confined. The earliest tramways of this kind which were successfully introduced consisted of a single, moving, endless rope,

country. In Europe, however, while these single-rope lines were also first in vogue, the double-rope system has of late years almost entirely supplanted them, and has established itself, as a general means of transportation, to an extent hardly yet dreamt of here.

Railroad companies have adopted these lines as regular feeders to their main roads, and laws have been promulgated in different European countries regulating their construction and traffic, the same as for ordinary railroads. This extension of their application is due principally, if not entirely, to the perfection attained under the Bleichert system, some features of which are shown in the accompanying illustrations. While the individual loads to be carried by the single-rope lines



THE BLEICHERT WIRE-ROPE TRAMWAY, 1,000 FOOT SPAN, OVER THE WEINBACH VALLEY.

from which the loads were suspended. In one system the buckets or carriers are attached to saddles, which ride on the rope, but can be separated from it. In another system the carriers are attached permanently to the rope. But in each of these systems one and the same rope both supports and moves the load.

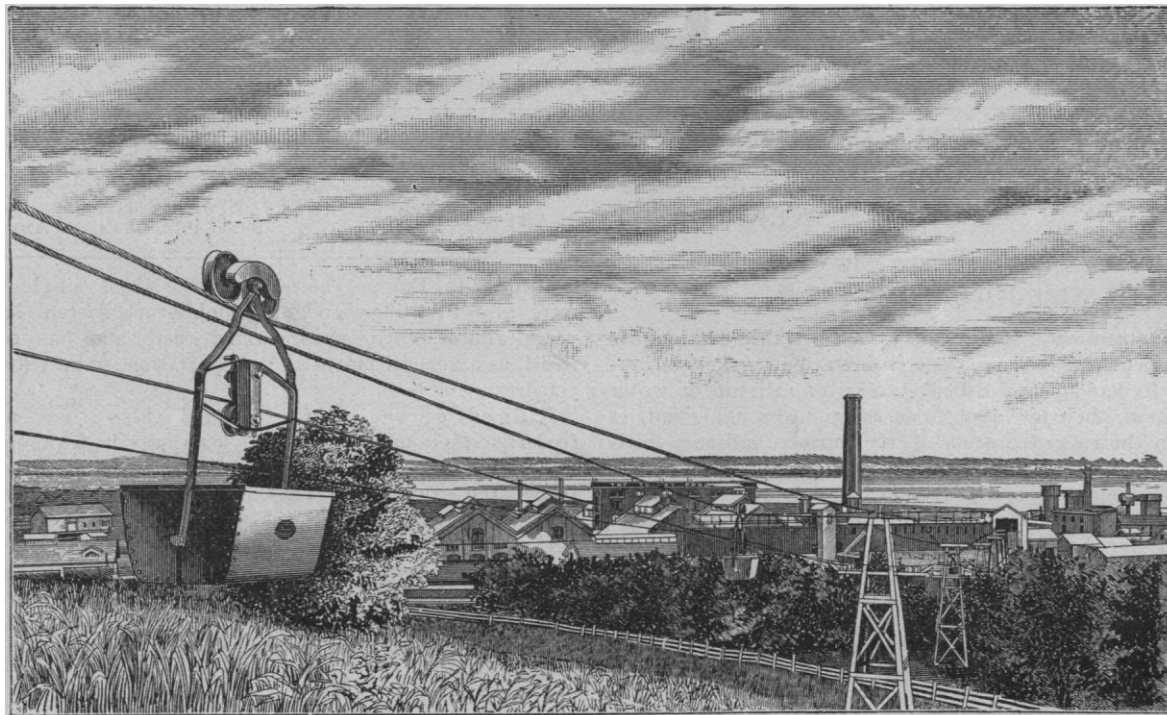
This fact is really the reason that aerial transportation has hitherto not become general in the United States. Lines constructed with the single moving rope, while very efficient for certain purposes, are not available for general use as a means of transportation, because of their limited capacity for carrying individual loads, which in no case can exceed 300 pounds, and in practice have been much smaller. The original single-rope systems are the ones chiefly used hitherto in this

should, for convenience and economy, preferably not exceed 150 pounds, and are, in fact, seldom over 100 pounds, the lines of this system are adaptable to individual loads up to 1,000 pounds each, and in special cases even heavier loads have been carried.

Single-rope systems of tramways, where the moving rope carries the load, must necessarily move slowly; otherwise there is great danger that the rope may jump out of the carrying-sheaves. These carrying-sheaves are very shallow, so as to permit the passage over them of the saddle or clip. The dropping of the rope from the supporting sheaves has always been a source of more or less trouble and expense in operating these lines. In this system this trouble never occurs, since the stationary carrying-cable has no tendency to leave the saddle

in which it is carried. This being the case, there is no difficulty in moving the cars of these lines at a speed of three or four miles an hour.

rope. While this corrects the danger of slipping, it gives rise to the objection that the buckets must be both loaded and unloaded while moving, since they cannot be stopped without

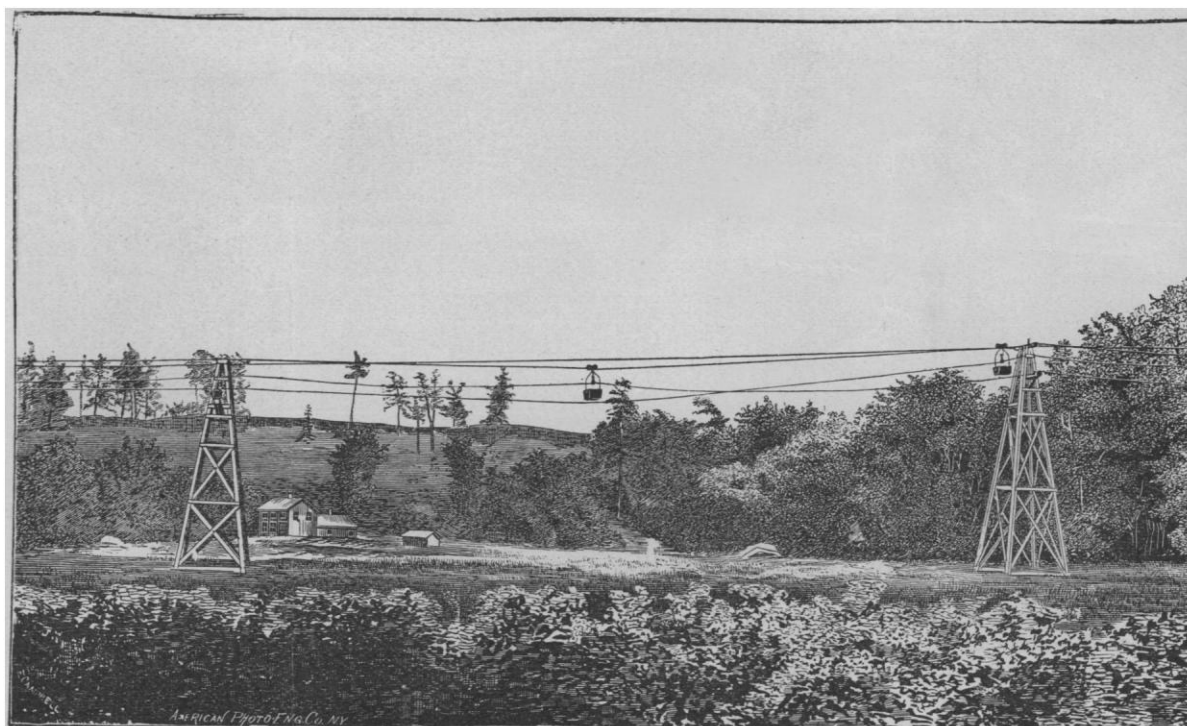


BLEICHERT WIRE-ROPE TRAMWAY OF THE SPLIT ROCK CABLE ROAD COMPANY, SYRACUSE, N.Y.

One of the advantages of these tramways over others consists in their capability of surmounting any grade.

In one system of single-rope tramways, no grades in the rope

stopping the whole line. In the system illustrated, both these objections are obviated. Any grade can easily be surmounted, provided the contour of the ground is such that the inclination



BLEICHERT WIRE-ROPE TRAMWAY OF THE SPLIT ROCK CABLE ROAD COMPANY, SYRACUSE, N.Y.

are permissible steeper than 1 in $3\frac{1}{2}$. In fact, 1 in 4 is really about the limit. On steeper grades there is danger of the load slipping on the rope. To obviate this danger, another system employs a clip which fastens the bucket permanently to the

of the carrying-cables is not steeper than 1 in 1. The inclination of these cables does not necessarily follow the contour of the ground in all cases. For instance: in crossing valleys and streams this system permits the use of long single spans,

which, in the case of the single-rope tramways, would be impracticable. Again: a precipitous rise in the ground presents no insuperable difficulties, since the curves can usually

The cost of both construction and maintenance is greatly increased for single-rope tramways by the use of spans longer than 100 feet, or the occurrence of very steep grades. Even if

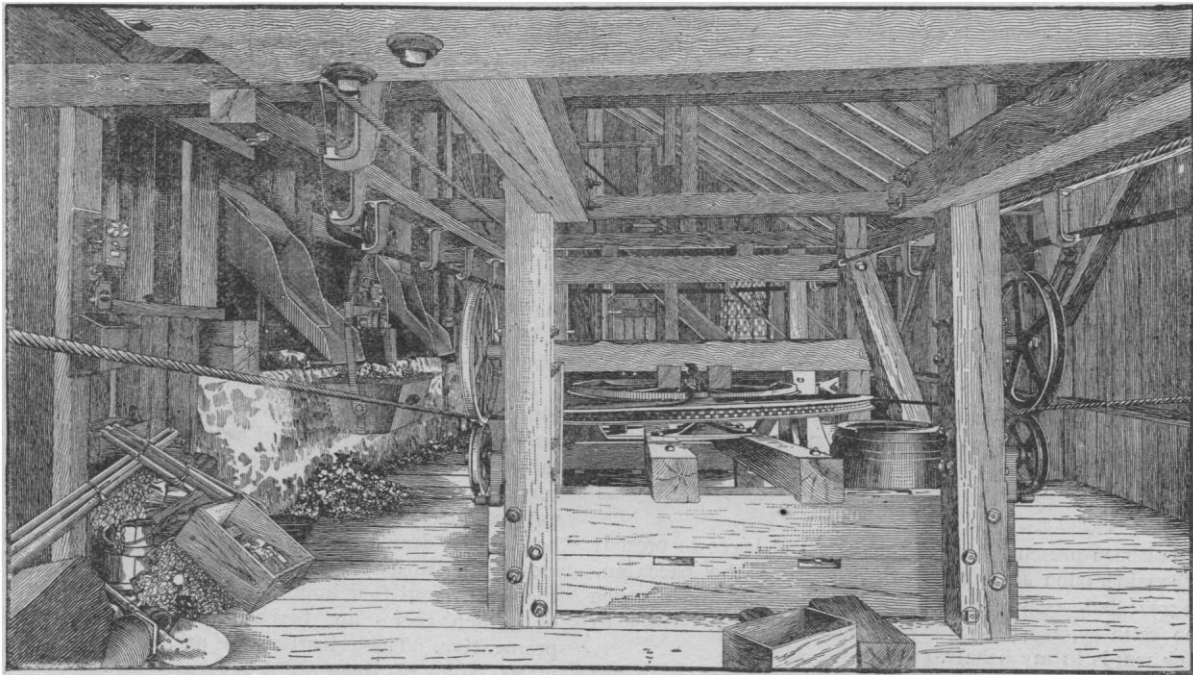


BLEICHERT WIRE-ROPE TRAMWAY AT GRANITE, MONTANA.

be laid out so as to bring the inclination of the carrying-cables within the proper limits.

The other objection is obviated by the arrangement that when the car reaches either terminal, or any switch or turn-out

only one such span, or one such grade, is present in a whole line, it becomes necessary to make the entire double length of moving rope strong enough for the special strain due to that one spot, over which, in its endless travel, every part of the rope



INTERIOR OF LOADING TERMINAL OF BLEICHERT WIRE-ROPE TRAMWAY AT GRANITE, MONTANA.

on the line, it can be automatically disconnected, and run off to any point required for loading and discharging. This system also permits the introduction at any point on the line of movable or temporary switches or terminals, without the erection of special structures for their support.

must pass; and this increase in the size of the rope affects the dimensions of the supports, sheaves, and other fixtures throughout the line, thus requiring a general increase of cost, nearly as great as if all the spans were equally long or all the grades equally heavy. The wear of the rope is also increased by reason.

of its greater diameter and the more unfavorable conditions of the catenary curve, or sag, on long spans and steep grades; and these sources of increased cost of maintenance affect every part of the rope. In this system the carrying-cable, being stationary, can be locally graduated to the strains it has to bear. The cable for the empty cars does not, of course, require to be as strong as the cable for the loaded cars, and it is therefore made only strong enough for the work it has to perform. In like manner, if one or more long spans occur in the line, it is not necessary that the whole cable should be made strong enough to bear the extra strain at this one point: on the contrary, it is sufficient to so strengthen only the portions exposed to this extra strain, and this is easily practicable. On very long steep grades also, where the cable at the head of the incline must be able to bear not only the ordinary working strain due to the cars, but must also sustain the whole weight of the cable on the incline, this is effected by making the cable in sections of gradually diminishing area, thus effecting great economy in the total weight of the cable. A further advantage is, that the traction-rope used, instead of being loaded down by the cars, as in other systems, is itself carried and supported by them, thus lessening greatly the wear.

The ordinary spans used in the construction of these lines are from 150 to 200 feet, but there is no real objection to spans of 500 to 600 feet. Many lines built within the last few years have spans up to 1,500 feet. The illustration on the first page, taken from a photograph, represents one of these long spans. It is 1,000 feet in the clear, and forms part of a line nearly seven miles in length, built for the transportation of 250 tons of iron ore per day. This line has been in successful operation for many years.

There exists in nature hardly a difficulty or obstacle which would bar the introduction of this system of transportation: in fact, in many cases it is the only one that can be used. While this is eminently true where the contour of the ground is much broken up and long spans are necessary, this system possesses economical advantages even where there are few or no natural obstacles to the building of any kind of road. The service is regular; stoppages for repairs are rare; no interruptions due either to atmospheric influences or storms are liable to occur; the line being elevated, the service is entirely free from interference with surface traffic; wear and tear and expense of operating are relatively very low; terminals can be so arranged that the material transported can be delivered at the exact spot where it is needed, thus saving all expense of re-handling. This could not be done with a surface road, since, even if the cars could be brought close to the point at which the material is required, there would still be a further expense for unloading, irrespective of the cost of switching and hauling them.

This system of transportation is controlled in this country by the Trenton Iron Company of Trenton, N.J.

THE SIGNIFICANCE OF THE DEGREE OF BACHELOR OF ARTS.

At the conference of college presidents and professors in Philadelphia, Nov. 26, 1889, Professor E. H. Griffin read a letter from President Gilman, dated Oct. 17 (published in the February number of the *Johns Hopkins University Circulars*) as follows:—

"If I had been present, I should have asked leave to present to your consideration some thoughts respecting the baccalaureate degree; but as I cannot attend, on account of absence from the country, I have requested Professor E. H. Griffin to say a few words in my behalf.

"The points to which I should have directed attention are these:—

"1st, The American propensity to multiply academic titles so that the real significance of a degree is obscured.

"2d, The tendency to confer the baccalaureate degree in so many forms and phrases that its meaning cannot be discovered even from the name of the institution which confers it, but

must often be worked out by a study of catalogues constructed in different orders of complexity.

"3d, The enumeration of the manifold forms of the baccalaureate degree now given in this country.

"4th, The historical significance of the bachelor's degree as marking attainment of the first grade in the fellowship of scholars, — a grade which may be attained in any faculty of a university, arts, medicine, theology, and law.

"5th, The value of a certificate the meaning of which is obvious at first sight, considered from the point of view of the holder of a diploma, and, second, from that of the public.

"6th, The importance of restoring, if possible, the baccalaureate degree to an honorable significance before it is altogether lost.

"7th, The importance of acknowledging that it is not essential that any one curriculum should be followed in order to attain the degree of bachelor of arts.

"8th, It is essential that the candidate who receives that degree should have received much instruction in (a) ancient and modern languages and literature, (b) in mathematics, (c) in the natural and physical sciences, and (d) in historical and moral sciences.

"9th, It is also essential that the candidate should pursue these studies in a public institution, under competent instructors, for a definite period, in a systematic way, subject to examination, the results of which are to be recorded, proclaimed, and certified to by a formal diploma." . . .

After reading the letter, Professor Griffin stated that there could be no doubt that the baccalaureate degree had lost something of the "honorable significance" of which President Gilman speaks. A recent writer in one of our magazines declares that "A. B. is as meaningless an abbreviation as exists." This, we are glad to know, continued Professor Griffin, is an exaggeration; but it is an exaggeration which contains an uncomfortable element of truth.

So far as it is true that the bachelor's degree has declined in dignity and value, the evil is a serious one. In view of its historical significance, the interests of learning and the credit of the fellowship of scholars require that this title, which marks the completion of a defined stage or period of training, should be kept in its original repute. It is a grave injustice that one who has gained the degree, at great expenditure of money, time, and labor, should find that others have gotten it upon so much easier terms that it becomes almost worthless as a guaranty of acquisition. The public have a right to assume that learned distinctions are bestowed in good faith, and upon some basis of common understanding, and ought not to be compelled to go back of academic titles to find out what they mean. Whether it be considered from the point of view of the public, or of the individual, or of the general interests of learning, few academic questions are of greater consequence than the proper significance, and most effective defence and maintenance, of the bachelor's degree.

The causes which have contributed to this loss of consideration are — some of them, at least — obvious.

As is well known, the institutions of higher learning first established in this country were modelled, not after the English universities, but after the English colleges. This was inevitable under the circumstances, and the American college has certainly shown itself well adapted to the conditions of our national life. As respects academic titles, however, the system has had its drawbacks. In Great Britain and Ireland there are eleven institutions conferring degrees; in the United States there are about four hundred, not counting colleges for women, of which there are perhaps one hundred exercising this prerogative. These institutions are, of course, of all grades of merit. Some of them are not greatly unlike the college in the Far West, of which Professor Bryce speaks in the "American Commonwealth," whose president had much to say about the views of his faculty, and what his faculty were going to do: the "faculty" consisting at the time, as it appeared, of that dignitary and his wife. A peculiar infelicity has attended our system as applied to honorary degrees, — as in theology and

law, — these being given by institutions which offer no instruction in these subjects. An eminent American composer is said to have declined the doctorate of music conferred by Yale, on the ground, that, as the university did not recognize this subject in its system of education, it was presumably incompetent to pronounce judgment about it. However uniform and thorough might be the standard of acquirement theoretically established by our colleges, their inordinate number, involving wide diversities of scholarly and teaching power, must prevent their certificates of graduation from bearing any thing like a uniform significance in respect to the amount and quality either of the instruction offered or of the proficiency attained.

So far as the bachelor's degree has suffered from this cause, there is probably no immediate remedy. The suggestion occasionally made, that the colleges of a State, or of a larger extent of territory, might, for certain purposes, affiliate themselves into a kind of university, and bestow degrees through a common board, is not likely to be received with favor. It is possible that something may be done toward the creation of a public sentiment unfavorable to the endowment and chartering of unnecessary institutions; but the main reliance must be upon such a gradual increase of resources and elevation of standards as shall diminish the evils which cannot be wholly removed. If an agreement of theory and practice could be reached among our most influential institutions in regard to the bachelor's degree, this would do more than any thing else to determine usage, and to fix the connotation of the title.

In looking over the reports of the commissioner of education, one is struck with the fertility of imagination and invention displayed in academic titles. The following enumeration of variations of the baccalaureate title is probably not exhaustive:—

Bachelor of arts, science, philosophy letters, laws, divinity, sacred theology, surgery, music, painting, pedagogics, English, English literature, Latin letters, agriculture, scientific agriculture, agricultural science, architecture, engineering, civil engineering, mining engineering, metallurgical engineering, mining metallurgy, chemical science, mechanic art, veterinary science, domestic art. The colleges for women add a new and pleasing element of variety from the fact that it seems to be supposed by some that the word "bachelor" is a designation of sex; and so we have licentiate, laureate, graduate, proficient, and, in more distinct antithesis to bachelor, maid.

The first criticism that one passes upon this list is that most of the titles indicate professional rather than liberal acquirements. The bachelor of science, of philosophy, of letters, may have pursued studies entitled to be called liberal; the same may be true of the bachelor of laws, divinity, music, of others in the list; but it is certain that the holders of most of these degrees have acquired a technical rather than a general training. Why, then, it may be asked, should they lay claim to the title to which usage has attached a different meaning? Is it historically just, or is it practically wise, to disregard the distinction between a technical and a liberal education by applying the baccalaureate title indifferently to both? Most of the colleges represented in the conference distinguish between the bachelor's degrees of arts, science, and philosophy, and the technical degrees, practical chemist, mining engineer, civil engineer, and the rest. It is important that those who hold to the old idea of a broad training in fundamental studies, precedent to specialization, should do this.

A question might arise as to what modifications of the baccalaureate title should be considered permissible under this principle. The degrees, bachelor of science, letters, and philosophy, are so well established that it is probably useless to make any objection to them; yet it is a fair question whether the subdivision is of any advantage. If these degrees do not certify to a course of study probably ranked as liberal, they ought not, according to this view, to be conferred; if they do, would not the simpler, more historical, more intelligible way be to comprise them all under the bachelor of arts? The contrast between the sciences and the humanities it may be well to recognize by retaining the bachelor of science; but bachelor of letters and bachelor of philosophy are of such indeterminate

significance that it would be a relief to have them abandoned. Is it worth while to retain degrees whose significance no one can tell without knowing the institution which conferred them, or then without a careful consultation of the catalogue? It seemed to Professor Griffin that the baccalaureate degree would be greatly augmented in dignity if it were conferred only under the title "bachelor of arts," or, at most, with the variation "bachelor of science."

If the reduction of all the non-technical degrees to a single form, or to two forms, were to be accomplished, it would be necessary to reach a more definite understanding than at present exists as to what constitutes a liberal education. The proposition laid down by President Gilman, that "it is not essential that any one curriculum should be followed in order to attain the degree of bachelor of arts," would now be generally conceded. The rigidly exacted course of study which formerly prevailed in all our institutions is now admitted to be impracticable. The effort to adapt it to the demands of the new sciences, and the modern languages and literatures, made it so fragmentary and kaleidoscopic, so far impaired its disciplinary power, that some change was acknowledged to be inevitable. The only difference of opinion now is as to what subjects shall be insisted upon. The modifications of the bachelor's degree first named (bachelor of science, philosophy, letters) ordinarily indicate that one, at least, of the classical languages has not been pursued. The absence of this acquisition seems to render the bachelor of arts degree unsuitable; and, in default of a scientific specialty, one of the other titles is resorted to. If it were decided to abandon these, what could be done for the class of students for whom they were designed? This must, of course, depend on one's view of what is necessary to a liberal culture. Why not give to those who have studied no ancient language such certificates and titles as best describe their work, and, to those who have sufficiently pursued one, concede the full rank of bachelor of arts?

That a liberal education may be properly held to require a wider historical and moral horizon than the modern tongues alone can give, can hardly be disputed. An acquaintance, at first hand, with the manners and sentiments of a civilization remote from our own, one unmodified by Christianity, is so pre-eminently liberalizing, so quickens one's power of intellectual sympathy, so deepens one's sense of the unity of history, so enlarges the range and perspective of one's thoughts, that it may properly be made the differentia between a general and a special training. But are two ancient languages necessary for this? Is it even necessary that one of the classical languages should be pursued? Would not Semitic or Sanscrit studies, if these should happen to be unaccompanied by Greek or Latin, secure the same end? The main thing is to get a genuine hold upon a distant past.

The literary and aesthetic reasons for the study of the classical languages, that is, of Greek, which is the real issue in the case, it is not necessary to belittle the force of. But how few candidates for the degree of bachelor of arts ever acquire any refinement or delicacy of Greek scholarship! How few teachers — happily there are signal and distinguished exceptions to this remark — teach Greek otherwise than as a grammatical drill, or, at the best, a philological discipline! Was ever the Hellenic spirit and form better reproduced than by Keats, who could not read Greek at all?

It is not, in Professor Griffin's opinion, easy to justify the insistence upon both Greek and Latin as essential to a liberal education. We may be in danger of displaying in behalf of Greek studies something of the same excessive deference to traditional habits and standards which worked so powerfully against their reception in the fifteenth century. It is undeniable that the majority of men in two, at least, of the so-called learned professions, — law and medicine, — in editorial work and in politics, are not, in the academic sense, liberally educated men. Is not this due in part to the fact that we have been too rigid at certain points, making our education seem remote from life and pedantic? If it should seem wise to bestow the bachelor of arts degree without Greek, we could simplify our

nomenclature by dispensing with the degrees of bachelor of letters and of philosophy; we could carry to full graduation some who now pursue partial courses of study; we could obviate criticisms, which proceed not always from so-called "practical" men, but often from persons abundantly qualified to form an opinion, — graduates, not rarely, of our own institutions.

"But while this additional freedom may wisely be conceded," the speaker went on to say, "it is of the last importance that we insist upon those fundamental subjects which any rational theory of a liberal education must include. President Gilman enumerates these as follows: 'It is essential that the candidate who receives that degree should have received much instruction in (a) ancient and modern languages and literature, (b) in mathematics, (c) in the natural and physical sciences, (d) in historical and moral sciences.' I need not stop to show why these four classes of subjects are essential: we are not likely to disagree about that. Experience has shown, what one's knowledge of human nature would lead one to expect, that young men, left wholly to themselves, will not apportion their time equitably between these different interests.

"Professor West of Princeton took the trouble, three or four years ago, to summarize the choices of elective studies made by members of a recent class at one of our leading colleges. A more careful administration of the system probably prevents, at the present time, such extreme abuse of liberty; yet these facts are instructive as an illustration of a danger against which we need to guard. The first man in standing omitted two of the classes of subjects named by President Gilman, taking no course in mathematics or in science. The second omitted nearly three, taking no course in mathematics, in science (except botany), in philosophy, history, or political science. The third took no science and no philosophy. The fourth took no course in philosophy, history, political science, classics, modern languages. How can we consider a man liberally educated who has studied, during his collegiate residence, no modern language, no ancient language, no logic, psychology, or ethics, no history, no political or social science? Omissions of like significance occur in the case of each of the ten highest men; while the men at the bottom of the class show a marked inclination to the easiest subjects. We cannot plead the example of the German universities, for we have no such preliminary training as the German gymnasia afford. It is obvious that unrestricted liberty of election cannot be permitted. No degradation of the baccalaureate degree is comparable to that which would come from the general adoption of such a system in our colleges. The degree has at present an approximate uniformity of meaning. This would speedily and totally disappear."

The suggestions which Professor Griffin offered, on the basis of President Gilman's paper, are these:—

1. Diminish the evils growing out of the number of our colleges, and the inferiority of some of them, through an agreement among the strongest and best, which would have the force of an authoritative example.

2. Distinguish sharply between the technical and the baccalaureate degrees, reducing the latter to one, or, at most, two forms.

3. Relax the requirement in regard to Greek, accepting one ancient language as sufficient for the bachelor of arts degree.

4. Allow no elections on the part of students that will prevent a suitable distribution of attention between the four great groups of subjects which have been named.

HEALTH MATTERS.

The Rôle of Potable Waters in the Etiology of Typhoid-Fever.

THERE has long been a consensus of medical opinion as to the rôle of drinking-water in the causation of typhoid, and facts to prove an etiological relation are accumulating every year. According to the *Boston Medical and Surgical Journal*, Vaillard

has made a communication to the Société Médicale des Hôpitaux, in which he furnishes new bacteriological proofs.

1. In March, 1889, there broke out in the regiment of cavalry quartered at Melun an epidemic of typhoid-fever, but only one squadron was affected. This squadron made use of the water of a particular well which had been contaminated in some unknown way. Repeated examinations of samples of this water revealed the presence of the *bacillus typhosus*.

2. At Cherbourg there was an epidemic of enteric-fever, affecting particularly a military company. The water-supply of this part of the city had been contaminated by typhoid dejections in a manner easily explicable, and samples of this water showed the *bacillus typhosus* in abundance.

3. Similar facts were noted with regard to epidemics which prevailed last year and the year before at Miranda, at Bourg-en-Bresse, and at Chatellerault.

M. Vaillard's method of identifying the typhoid bacillus seems to have been in accordance with the most approved data of bacteriological science.

At the same meeting, Chantemesse stated some facts of interest respecting the influence of Seine water on the prevalence of typhoid epidemics. It was remarkable, that whenever, from accident happening to the reservoirs or mains of the other water sources, the water of the Seine was distributed to the various departments and drank by the inhabitants or the soldiery, an epidemic of typhoid appeared.

This statement was corroborated by M. Schneider at a meeting of the Société de Médecine Publique, Dec. 27, 1889, who also showed, by facts that had come under his own observation as military surgeon, that the use of Seine water for drinking had repeatedly been followed by epidemics of enteric-fever. Such an epidemic has recently prevailed in the barracks of Paris, owing to the temporary shutting-off of the water of the Vanne, which seems to be of exceptional purity.

The Grippe and Cholera.

Fears having been expressed as to a possible connection between influenza and cholera epidemics, Dr. Smolenski publishes, in the Russian *Official Messenger*, an elaborate report upon the subject. He points out that the suspicion is not new, and that in 1837 it was discussed by Gluge ('Die Influenza'), and refuted. In fact, influenza or *grippe* epidemics have been known in Europe since 1173, that is, for more than seven hundred years; while the first cholera epidemic appeared in Europe in 1823, but did not spread that time farther than Astrakhan. Six years later it broke out in Orenburg; next year, in Caucasia and Astrakhan again, whence it spread over Russia, and in 1831 reached western Europe. As a rule, influenza spreads very rapidly; and at St. Petersburg in 1782, says *Nature*, no fewer than forty thousand persons fell ill of it on the same day (Jan. 14). In 1833 its progress was also very rapid, and within a few days it appeared at places so far apart as Moscow, Odessa, Alexandria, and Paris; while cholera epidemics are usually slow in their migrations from one place to another. Moreover, influenza is chiefly a winter epidemic, while cholera prefers the spring and the summer.

Dr. Smolenski has further tabulated all influenza and cholera epidemics which have broken out in the course of this century in Europe; and he comes to the following results: influenza broke out in 1816 in Iceland; 1827, in Russia and Siberia; 1830-33, in Europe generally; 1836-37, in Europe; 1838, in Iceland; 1841-48 and 1850-51, in Europe; 1853, in the Faroe Islands; 1854-55 and 1857-58, in Europe; 1856, in Iceland and the Faroe Islands; 1862, Holland and Spain; 1863-64, France and Switzerland; 1866, France and Great Britain; 1867, France, Germany, and Belgium; 1868, Turkey; and 1874-75, western Europe. As to the cholera epidemics during the same period, they were, 1823, Astrakhan and Caucasia (from Persia); 1829, Orenburg (from Turkestan); 1830, Russia (from Persia); 1831-37, various parts of Europe. The next epidemic appeared in 1846 in Transcaucasia (coming from Persia); in 1847 it spread over Siberia and Russia, and in 1848 it was in Europe; in 1849-52 it was followed by feeble outbreaks all over Europe. The third cholera

epidemic came from Persia again in 1852, and it resulted in a severe outbreak during the years 1853-55 in Europe, followed by feebler outbreaks till 1861. The fourth cholera epidemic came through the Mediterranean ports in 1865, and lasted in Europe till 1868, with feebler epidemics in 1869-74. The latest invasion of cholera was in 1884, when it came again through the Mediterranean ports. As to the cholera epidemic which now begins to die out in Persia and Mesopotamia, it certainly is a danger; the more so, as, out of the five epidemics of cholera which have visited Europe, three have come from Persia.

BURIAL REFORM IN ENGLAND.—After a period of incubation which has been spent in educating public opinion in the matter of the hygienic iniquity of the present system of interment, the group of sanitary philanthropists, with the Duke of Westminster at their head, who have taken up the ungrateful task of bringing the necessary reforms to pass, have at last decided to approach the government with the object of having their contentions indorsed by the Legislature. How far the general public will consent to allow their cherished usages in this respect to be interfered with, we are unable to guess, but the object in view will certainly commend itself to those who have a thought beyond the morrow. What is required, says the *Medical Press and Circular* of Jan. 1, 1890, is the prohibition of leaden and other solidly constructed coffins, the effect of which is to indefinitely retard complete decomposition, and so prolong the period during which the dead are not only æsthetically objectionable, but are an indisputable source of danger to the living, wicker-work or *papier-maché* receptacles alone being used. This is, after all, no very startling innovation, and is not open to the sentimental and theological objections which some persons entertain to the more radical plan of cremation. It is merely a sanitary precaution of an elementary kind; and, whatever the immediate fate of the movement may be, it must sooner or later impose itself. The effect of legislative interference would simply be to hasten and generalize the practice among those who have too much to do in this world to find time to decide upon the material of which their coffin is to be made. We are rather inclined to agree with Sir Spencer Wells in his suggestion that in future only properly cremated remains should be admitted to funeral honors in Westminster Abbey and other national mausoleums. Not only would there result a valuable economy of space, but the very deleterious odor of decomposing sanctity which pervades many sacred edifices would be done away with.

ACTION OF THE LIVER ON POISONS.—Dr. Roger points out that the liver modifies the toxic effects of several poisons, as has already been noted by Schiff, Hegar, Jacques, and Lautenbach. He has performed certain experiments, as we learn from the *Provincial Medical Journal*, which demonstrate clearly its modifying action with regard to nicotine, atropine, quinine, and strychnine; also certain putrid and intestinal poisons, peptones, and some salts, particularly ammoniacal salts. On the other hand, the liver exercises no influence over other substances, such as digitaline, some salts (potash and soda), glycerine, etc. The liver, therefore, like the kidney, possesses an elective action. To control these results, it is necessary that the poison should be absorbed very slowly. In the case of a diseased liver (cirrhosis, fatty degeneration, etc.), in which the parenchyma no longer contains glycogen, the liver does not act on poisons, but it suffices to administer substances capable of forming glycogen, to see the hepatic gland again competent to transform poisons. The action of the healthy liver is continually exerted against toxic substances in the system; it is still more marked in those infectious diseases in which decided toxic effects are produced. Some clinical facts go to prove that many morbid symptoms are due to insufficiency of the liver in regard to poisons.

DOES SALTING MEAT DESTROY BACTERIA?—Professor J. Forster of Amsterdam has published an account of some investigations made in his laboratory by himself and De Freytag, having for their object the determination of the effect of the common process of salting or pickling meat on various forms of bacteria.

It was found, as stated in the *British Medical Journal*, that cholera bacilli were soon destroyed under the influence of abundance of salt, usually in a few hours, but that typhoid bacilli, pyogenic staphylococci, the streptococci of erysipelas, and the bacilli of porcine infectious diseases, frequently retained their vitality for several weeks, or even months, in spite of the presence of abundance of salt. The same was also true of the bacilli of tubercle. In some cases these bacilli were found alive after being two months in pickle, their vitality being proved by their capacity for infecting new cultures. Portions of the viscera of a tuberculous animal, preserved for a considerable time in salt, were found capable of causing tuberculosis in a healthy animal when introduced into its peritoneal cavity. Experiments on the spleen of an animal which had died of malignant anthrax showed that salt possessed the power of destroying the bacilli of this disease in about eighteen hours. These, as well as cholera bacilli, were found to require seven and one-half per cent of salt to destroy them. From these facts it would appear that salting or pickling has but little destructive effect on many of the more common forms of bacilli liable to be found in diseased meat.

THE ELECTRICAL PHENOMENA OF THE HUMAN HEART.—A special meeting of the Berlin Physiological Society was called by Professor Dubois-Reymond on Dec. 27, 1889, in order to see a demonstration by Dr. Augustus Waller on man and uninjured animals of the electro-motive action accompanying the beat of the heart. Besides the ordinary members of the society, the leading physicists of Berlin were invited, and Professors Helmholtz and Kundt witnessed the experiments. Dr. Waller, says the *British Medical Journal* of Jan. 11, employed the capillary electrometer magnified 1,250 times, and thrown on a ground-glass screen in one of the lecture-rooms of the Physiological Institute, and demonstrated the electro-motive action of the heart on a horse and on a dog. The horse stood in a courtyard near the lecture-room. Electrodes were attached to his extremities by firm bands, and the wires from the electrodes were passed through the window to the electrometer in the preparation-room adjoining the lecture-room. The dog stood in the lecture-room. In the library of the institute, Professor Dubois-Reymond allowed the demonstration to be made on himself, so that the pulsations might be seen directly through the microscope by all the members present.

THE HEALTH OF LONDON IN 1889.—Remarkable as has been the continual decline of the death-rate in England and Wales in recent years, the decrease of the rate of mortality in London, with its aggregate population of more than four millions, with constantly increasing density, is still more remarkable, says the *Lancet* of Jan. 4, 1890. The registrar-general, in his last annual summary, reported that the death-rate registration in London in 1888 was 18.5 per 1,000, being "far the lowest death-rate as yet recorded in London," the next lowest being 19.8, 19.9, and 19.6 in the three immediately preceding years, 1885, 1886, 1887, previous to which the London death-rate had never fallen below 20 per 1,000. The death-rate in 1889, moreover, again fell, and was considerably below the low rate in 1888. The registrar-general's return for the fifty-second week of 1889 affords the means of calculating that the mean annual death-rate in London in the fifty-two weeks of last year did not exceed 17.5 per 1,000, which was 1 per 1,000 below the rate in 1888.

FLOODS AND THEIR RESULTS FROM A SANITARY STANDPOINT.—We learn from the *Medical Record* that arrangements have been made to hold a tri-State sanitary convention at Wheeling, W. Va., Feb 27 and 28, 1890. Representatives will be present with papers and addresses from Pennsylvania, West Virginia, and Ohio. The object of the convention is to consider the question of floods and their results from a sanitary standpoint, and the best methods of managing the sanitary interests of a given community after such a calamity. Owing to the mutual relations held by these three States with reference to large rivers, and the numerous towns in each one of these States that are annually affected by floods and their results, it has

been thought wise to hold a convention for studying how best to manage the sanitary interests of cities and towns so affected. Every person interested directly or indirectly in this important subject is earnestly requested to be present and assist in discussing the papers, and add whatever information he can to the solution of these practical and most important questions, affecting as they do the health and lives of thousands of citizens of these three great commonwealths annually.

CHOLERA AND EUROPE.—The epidemic of cholera which has for so many months been raging in the valleys of the Tigris and Euphrates and the interior of Mesopotamia has also made considerable inroads into Persia. Reports of the epidemic having crossed the western boundary of Persia have been heard from time to time; but it has now been announced to the Faculty of Medicine of Paris, that there has been an alarming increase of the disease in central Persia and on the Turko-Persian frontier, and that the inhabitants are fleeing toward the north. All those who can afford the journey are trying to reach the Russian ports on the Caspian. Remembering that this is the route into Europe which the cholera has so frequently taken, the announcement, says *The Medical and Surgical Reporter*, must be regarded as one of great gravity.

MENTAL SCIENCE.

THE RAPIDITY OF MENTAL PROCESSES IN INSANITY.—The fact that the change in the mode of responding to the stimuli of the environment, characteristic of a disturbed mental equilibrium, will reveal itself in things important and trivial, has often been emphasized and illustrated. In this respect a comparison of the time required for performing simple mental operations in the insane with similar times in normal individuals is interesting, especially if we take account of the nature of the disease. The chief point in such an investigation is to secure a fair comparison,—a desideratum which former studies have not sufficiently taken into account. The most recent contribution to this field comes from a lady (Marie Walitzky, *Revue Philosophique*, December, 1889), and furnishes interesting results, based upon a sound method. She has chosen for her subjects men of good education—physicians, military officers, bankers, etc.—suffering from mental disease, and compared the times they require for executing certain mental processes with the times required for the performance of the very same processes, tested by the same apparatus, under the same conditions, by healthy physicians and other intelligent persons. The subjects were three persons suffering from paralytic dementia,—a case of remission after intense maniacal excitement; a case of general paralysis (in the initial stage of excitability); and another case observed at two different stages (in the period of remission, and in a state of maniacal agitation). Experiments were also made upon another patient whose disease is not altogether clear, and who was in a condition very nearly normal. The preliminary stages of practice were overcome; though times differing largely from the average always occurred, and had to be rejected. The processes studied were (1) the simple re-action time (with each hand) to a sound; (2) a choice of re-action, re-acting with the one hand to a loud sound, and with the other to a low one; (3) the re-action to a spoken word; (4) the ordinary association of one word with another; (5) the addition of one number to another. The associations were further distinguished as external, e.g., *flour-hour*, *mouth-nose*, in which the link was not logical, but rather accidental; internal or logical associations, such as *table-round*, *house-dwelling*; and associations fixed by habit, such as *pater-noster*, *Adam-Eve*. Of course, these distinctions are neither absolute nor always easy to apply, and the same association may take place differently in different persons. Each average for each subject is founded upon about a hundred and fifty observations. The most important conclusions are the following: in the three cases of paralytic dementia the simple re-action time is lengthened, .225, .388, and .364 of a second; while in the average of five healthy individuals this average was .188 of a second; while in the other cases, mainly condi-

tions of remission, no essential difference exists, the average time being .201 of a second. The difference in the time of re-action to a weak and to a strong stimulus is about the same in sane and insane, except in the two most pronounced cases of paralytic dementia, where the additional time needed to re-act to a slight stimulus is one-tenth of a second or more. The choice time is (and a similar relation holds of the other times) often three or four times as long in the paralytic dementia as in sanity, but approaches, though it is far from reaching, the normal in the states of remission: dementia, .816 of a second; remission, .629 of a second; normal, .364 of a second. The re-action to words is markedly longer than the normal only in the severest case of dementia, .864 of a second; normal, .285 of a second. The association time is most lengthened in a state of remission approaching melancholy, 1.377 seconds; in the state of remission, as in paralytic dementia, it approaches the normal, .898 of a second (normal, .680 of a second). In mania this time is shortened, .263 of a second. In those cases in which the patient was observed in two different stages of the disease, the same result is confirmed: the association time diminishes, and the choice time increases, as the maniacal agitation becomes more pronounced. The observations respecting the nature of the association are too limited to be separately discussed. These results suggest to the authoress the view, that, granting a reduction in association time to be dependent upon the faculty of unconsciously reproducing the associations fixed in the memory, the automatic function of the mind is increased in the initial stages of mental impairment, and that, parallel with this increase of mental automatism, the activity of the will decreases, its processes being slower. As the intellectual powers fade, the automatic functions also become slow, and finally even the perception of the simplest impressions is slackened. In the period of remission, even at its best, the mental powers do not fully recover: the automatism of the brain becomes normal, but the recovery of the will is incomplete.

A CURIOUS MENTAL TRAIT.—A correspondent of the German Anthropological Society tells of his meeting a farmer by the name of Löwendorf, who had a peculiar habit of writing "Austug" for "August," his Christian name. Some years later he was inspecting a school, and heard a little girl read "leneb" for "leben," "naled" for "nadel," and the like. Upon inquiring, he found that her name was Löwendorf, and that she was a daughter of his former friend the farmer, now dead. This defect was noticeable in the speech and writing of both father and daughter. It appeared in the father as the result of a fall that occurred some time before the birth of his daughter.

NOTES AND NEWS.

WE regret to announce the death of Gustave-Adolphe Hirn, the eminent physicist. He died at Colmar on Jan. 14, in his seventy-fifth year.

—A new kind of butter is now being made in Germany from cocoanut-milk. The Calcutta correspondent of the *London Times* says that the cocoanuts required for this industry are imported in large numbers from India, chiefly Bombay, and that the trade seems likely to attain still greater importance.

—Special attention was called by the United States Hydrographic Office to the unusually early southward movement of ice. Already (Feb. 1) thirty-six reports have been received of ice sighted since Jan. 5, and the positions and dates indicate that the ice season is one of the earliest on record,—nearly a month earlier than usual. This is undoubtedly due in large part to the prevalence of severe northerly gales east of Labrador, coincident with the heavy westerly gales of December and January along the transatlantic route. Masters of vessels should keep well clear of the Grand Banks for a few months, till there is less danger from icebergs and field-ice.

—Professor S. P. Langley, in a paper on the "Temperature of the Moon," in the December *Journal of Science*, states, that, of

the numerous conclusions to be drawn from this research, the most important one is that the mean temperature of the sunlit lunar soil is much lower than has been supposed, and is probably not greatly above zero Centigrade. In a postscript Professor Langley says, "I would ask to be allowed here to state that the very considerable expense for the special means and reduction of the preceding series of lunar researches was borne by one of the most generous and disinterested friends that science has had in this country,—the late William Thaw of Pittsburgh. By his own wish, no mention of his name was made in previous publications in connection with the results so greatly indebted to his aid. His recent death seems to remove the restriction imposed by such a rare disinterestedness."

—The proceedings of the International Marine Conference came to an end Dec. 31, 1889, and a final act has been issued showing for each division of the programme, and in the order of the divisions, the resolutions adopted. The delegations of the twenty-eight nations represented will now make their reports to their home governments, but none of the rules adopted will go into effect until approved and enforced by appropriate legislation. Relative to the great question of course-indicating sound-signals in foggy or thick weather, it was decided, after mature deliberation, that it is inexpedient to adopt any one of the various systems proposed. The various other questions before the conference, such as lights, sound-signals, distress-signals, regulations regarding the seaworthiness, draught, and designation of vessels, the saving of life and property from shipwreck, qualifications for officers and seamen, steamer-lanes, etc., were considered thoroughly, and the conclusions arrived at must command general attention and respect. It is of interest to note here that the carrying of white range-lights by steamers is favored, although not made obligatory; and steamer-lanes for transatlantic navigation are not adopted, although the various companies are urged to adopt regular routes for vessels of their own lines. The increased attention given to such subjects as the removal of dangerous derelicts and the use of oil to prevent heavy seas from breaking on board is of especial interest to the United States Hydrographic Office, in view of the efforts made to circulate information on these subjects by the "Pilot Chart."

—The International Horticultural Exhibition to be held in Berlin under royal and imperial auspices, from April 25 to May 5, will be characterized by two special features,—an exhibition of horticultural architecture, and one of horticultural models, apparatus, etc. It is requested that all exhibits or announcements of such should be promptly sent to the general secretary of the Society for the Promotion of Horticulture, Professor Dr. L. Wittmack, Invalidenstrasse 42, Berlin N., from whom all further information may be obtained. The exhibition will be held in the Royal Agricultural Exhibition Building, on the Lehn Railway. The general organizer of the scientific department is Professor Dr. Pringsheim, and the following gentlemen have undertaken the management of special branches: for the geography of plants, Professor Dr. Ascherson; for physiology, Professor Dr. Frank; for seeds, Herr P. Hennings; for morphology, anatomy, and the history of development, Professor Dr. Kny; for fungi, Professor Dr. Magnus; for soils, Professor Dr. Orth; for history, literature, and miscellaneous, Dr. Schumann; for officinal and technical objects, Dr. Tschirch. The minister for agriculture, Dr. Freiherr v. Lucius-Balhausen, will be the honorary president of the exhibition. The city of Berlin has granted the sum of 15,000 marks towards its expenses, and a guaranty fund of 80,000 marks has been raised.

—The marine meteorological service in the Spanish West Indies was organized about a year ago, and was in active operation during the last hurricane season, as already stated on the "Pilot Chart." Its importance to the West Indies, Mexico, and the United States, as well as to the commerce of every nation navigating the Bay of North America, is so great that it is gratifying to learn that its establishment has been definitely approved by a recent royal order issued through the minister of marine, Madrid. It is in charge of a commander in the navy, assisted by two lieutenants, with headquarters in Havana, at the Comandancia Gen-

eral del Apostadero, and a number of secondary reporting stations at points along the coasts of Cuba and Porto Rico. Capt. Luis García y Carbonell, who has organized the service, has been designated as its director. The United States Hydrographic Office has already, upon several occasions, acknowledged valuable assistance from Capt. Carbonell, and it regards the establishment of this weather service upon a permanent and effective basis as of the greatest importance to the interests of commerce.

—The month of January was remarkable for the tempestuous weather that prevailed almost uninterruptedly over the transatlantic steamship routes. Storms succeeded each other in rapid succession, the majority of them having developed inland, and moved east-north-east, on very similar paths, from Nova Scotia and across southern Newfoundland. The most notable storm of the month was probably the one that developed in the St. Lawrence valley, and moved out to sea across the Straits of Belle Isle early on the 3d, when it was central about latitude 52° north, longitude 48° west. It then moved nearly due east, rapidly increasing in intensity, until reaching the 20th meridian, when it curved to the north-eastward, and was central on the 5th about latitude 55° north, longitude 17° west, and disappeared north of Scotland. The barometric pressure in this storm was remarkably low, the lowest corrected reading reported being 27.93, at 4 P.M., Jan. 4, about latitude 53° north, longitude 23° west. This was reported to the United States Hydrographic Office by Capt. Johnson, of the British steamship "Connemara," who further states that the storm was accompanied by winds of hurricane force, with terrific squalls, occasional hail, and mountainous seas.

—The January number of the *Kew Bulletin* contained an able and most interesting report, by Dr. Francis Oliver, on the so-called weather-plant. This plant is *Abrus precatorius*, Linn., a well-known tropical weed. Mr. Joseph F. Nowack claims to have discovered that its leaves have "the peculiar property of indicating by their position various changes in nature about forty-eight hours before the said changes occur." Numerous observations with hundreds of such plants have convinced him that "any given position of the leaves corresponds always to a certain condition of the weather forty-eight hours afterwards." Some time ago he devised an apparatus for the purpose of putting his supposed discovery to practical use. It consists of a "transparent vessel containing the weather-plant, closed on all sides, protected against injurious external influences, and adapted to be internally ventilated and maintained at a temperature of at least 18° Reaumur, these being the conditions under which, in temperate climates, Nowack's weather-plant answers the purpose of a weather-indicator." Last year Mr. Nowack was anxious that his apparatus should be scientifically tested at Kew, but it would not have been easy for any member of the staff of the Royal Gardens to find time for the necessary observations. The task was undertaken by Dr. Francis Oliver, who now presents the results of his investigation. The following, as we learn from *Nature*, is a summary of the conclusions at which he has arrived: "I contend that all the movements exhibited by the leaves of *Abrus precatorius* depend on causes not so far to seek as those suggested by Mr. Nowack. The ordinary movements of the leaflets, of rising and falling, are called forth in the main by changes in the intensity of the light. In a humid atmosphere they are more sluggish than in a relatively dry one. In other words, when the conditions are favorable for transpiration, the movements are most active. The position for snow and hail is connected intimately, in the cases that have come under my observation, with a spotting or biting (by insects) of the leaflets, and is not due to any other external factor. The position for fog and mist, and for electricity in the air, is probably due to the disturbance caused by varying light, the rhythmical movements of the leaflets being temporarily overthrown. The position indicating thunder and lightning I take to be pathological from its tendency to recur on the same leaves. Daily movements of the rachis constitute a periodic function in this as in many other plants with pinnate leaves. The regularity of these oscillations is considerably influenced by both light and temperature."

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THE PALEONTOLOGICAL EVIDENCE FOR THE TRANSMISSION OF ACQUIRED CHARACTERS.¹

MUCH of the evidence brought forward in France and Germany in support of the transmission of acquired characters, which has been so ably criticised in Weismann's recent essays, is of a very different order from that forming the main position of the so-called Neo-Lamarckians in America. It is true that most American zoologists, somewhat upon Semper's lines, have supported the theory of the direct action of environment, always assuming, however, the question of transmission. But Cope, the able if somewhat extreme advocate of these views, with Hyatt, Ryder, Brooks, Dall, and others, holding that "the survival of the fittest" is now amply demonstrated, submit that, in our present need of an explanation of the origin of the fittest, the principle of selection is inadequate, and have brought forward and discussed the evidence for the inherited modifications produced by re-actions in the organism itself: in other words, the indirect action of environment. The supposed arguments from pathology and mutilations have not been considered at all: these would involve the immediate inheritance of characters impressed upon the organism and not springing from internal re-actions, and thus differ, both in the element of time and in their essential principle, from the above. As the selection principle is allowed

¹ This article is an informal reply to the position taken by Professor Weismann in his essays upon heredity. I have borrowed freely from the materials of Cope, Ryder, and others, without thinking it necessary to give acknowledgment in each case. [Reprinted from Nature.]

all that Darwin claimed for it in his later writings, this school stands for Lamarckism *plus* — not *versus* — Darwinism, as Lankester has recently put it. There is naturally a diversity of opinion as to how far each of these principles is operative, not that they conflict.

The following views are adopted from those held by Cope and others, so far as they conform to my own observations and apply to the class of variations which come within the range of paleontological evidence. In the life of the individual, adaptation is increased by local and general metatrophic changes, of necessity correlated, which take place most rapidly in the regions of least perfect adaptation, since here the re-actions are greatest. The main trend of variation is determined by the slow transmission, not of the full increase of adaptation, but of the disposition to adaptive atrophy or hypertrophy at certain points. The variations thus transmitted are accumulated by the selection of the individuals in which they are most marked, and by the extinction of inadaptive varieties or species. Selection is thus of the *ensemble* of new and modified characters. Finally, there is sufficient paleontological and morphological evidence that acquired characters, in the above limited sense, are transmitted.

In the present state of discussion, every thing turns upon the last proposition. While we freely admit that transmission has been generally assumed, a mass of direct evidence for this assumption has nevertheless been accumulating, chiefly in the field of paleontology. This has evidently not reached Professor Weismann, for no one could show a fairer controversial spirit, when he states repeatedly, "Not a single fact hitherto brought forward can be accepted as proof of the assumption." It is, of course, possible for a number of writers to fall together into a false line of reasoning from certain facts. It must, however, be pointed out that we are now deciding between two alternatives only; viz., pure selection, and selection *plus* transmission.

The distinctive feature of our rich paleontological evidence is that it covers the entire pedigree of variations: we are present not only at, but before birth, so to speak. Among many examples, I shall select here only a single illustration from the mammalian series,—the evolution of the molar teeth associated with the peculiar evolution of the feet in the horses. The feet, starting with plantigrade bear-like forms, present a continuous series of re-adjustments of the twenty-six original elements to digitigradism which furnish proof sufficient to the Lamarckian. But, as selectionists would explain this complex development and reduction by panmixia and the selection of favorable fortuitous correlations of elements already present, the teeth render us more direct service in this discussion, since they furnish not only the most intricate correlations and re-adjustments, but the complete history of the addition of a number of entirely new elements,—the rise of useful structures from their minute embryonic, apparently useless, condition, the most vulnerable point in the pure selection theory. Here are opportunities we have never enjoyed before in the study of the variation problem.

The first undoubted ancestor of the horse is *Hyracotherium*. Let us look back into the early history of its multicuspid upper molars, every step of which is now known. Upon the probability that mammalian teeth were developed from the reptilian type, Cope predicted in 1871 that the first accessory cusps would be found on the anterior and posterior slopes of a single cone; i.e., at the points of interference of an isognathous series in closing the jaws. Much later I showed that precisely this condition is filled in the unique molars of the Upper Triassic *Dromotherium*. These, with the main cusp, form the three elements of the tributercular crown. Passing by several well-known stages, we reach one in which the heel of the lower molars intersects, and, by wearing, produces depressions in the transverse ridges of the upper molars. At these points are developed the intermediate tubercles which play so important a rôle in the history of the ungulate molars. So, without a doubt, every one of the five main component cusps superadded to the original cones is first prophesied by a point of extreme wear, replaced by a minute tubercle, and grows into a cusp. The most worn teeth, i.e., the first true molars, are those in which these processes take place most rapidly. We compare hundreds of specimens of related

species. Everywhere we find the same variations at the same stages, differing only in size, never in position. We extend the comparison to a widely separate phylum, and find the same pattern in a similar process of evolution. Excepting in two or three side-lines, the teeth of all the *Mammalia* have passed through closely parallel early stages of evolution, enabling us to formulate a law: The new main elements of the crown make their appearance at the first points of contact and chief points of wear of the teeth in preceding periods. Whatever may be true of spontaneous variations in other parts of the organism, these new cusps arise in the perfectly definite lines of growth. Now, upon the hypothesis that the modifications induced in the organism by use and disuse have no directive influence upon variations, all these instances of sequence must be considered coincidences. If there is no causal relationship, what other meaning can this sequence have? Even if useful new adjustments of elements already existing may arise independently of use, why should the origin of new elements conform to this law? Granting the possibility that the struggle for existence is so intense that a minute new cusp will be selected if it happens to arise at the right point, where are the non-selected new elements, the experimental failures of nature? We do not find them. Paleontology has, indeed, nothing to say upon individual selection, but chapters upon unsuccessful species and genera. Here is a practical confirmation of many of the most forcible theoretical objections which have been urged against the selection theory.

Now, after observing these principles operating in the teeth, look at the question enlarged by the evolution of parallel species of the horse series in America and Europe, and add to the development of the teeth what is observed in progress in the feet. Here is the problem of correlation in a stronger form even than that presented by Spencer and Romanes. To vary the mode of statement, what must be assumed in the strict application of the selection theory? (a) That variations in the lower molars correlated with coincident variations of reversed patterns in the upper molars, these with metamorphoses in the premolars and pocketing of the incisor enamel; (b) all new elements and forms, at first so minute as to be barely visible, immediately selected and accumulated; (c) in the same individuals, favorable variations in the proportions of the digits, involving re-adjustments in the entire limbs and skeleton, all coincident with those in the teeth; (d) finally, all the above new variations, correlations, and re-adjustments not found in the hereditary germ-plasm of one period, but arising fortuitously by the union of different strains, observed to occur simultaneously and to be selected at the same rate in the species of the Rocky Mountains, the Thames valley, and Switzerland. These assumptions, if any thing, are understated. Any one of them seems to introduce the element of the inconstant; whereas in the marvellous parallelism, even to minute teeth-markings and osteological characters, in all the widely distributed forms between *Hyracotherium* and *Equus*, the most striking feature is the constant. Viewed as a whole, this evolution is one of uniform and uninterrupted progression, taking place simultaneously in all the details of structure over great areas. So nearly does race adaptation seem to conform to the laws of progressive adaptation in the individual, that, endowing the teeth with the power of immediate re-active growth like that of the skeleton, we can conceive the transformation of a single individual from the eocene five-toed bunodont into the modern horse.

The special application of the Lamarckian theory to the evolution of the teeth is not without its difficulties, some of which have been pointed out to me by Mr. E. B. Poulton. To the objection that the teeth are formed before piercing the gum, and the wear produces a loss of tissue, it may be replied that it is not the growth, but the re-action which produces it, which is supposed to be transmitted. Again, this is said to prove too much. Why is the growth of these cusps not continuous? This may be met in several ways: first, in the organism itself these re-actions are least in the best adapted structures, a proposition which is more readily demonstrated in the feet than in the teeth (moreover, since the resulting growth never exceeds the uses of the individual, there is a natural limit to its transmission);

second, the growth of the molars is limited by the nutritive supply (we observe one tooth or part growing at the expense of another); third, in some phyla we do observe growth which appears to lead to inadaptation, and is followed by extinction. In one instance we observe the recession of one cusp taking place *pari passu* with the development of the one opposed to it. These and many more general objections may be removed later; but they are of such force, that, even granting our own premises, we cannot now claim to offer a perfectly satisfactory explanation of all the facts.

The evidence in this field for, is still much stronger than that against, this theory. To sum up: the new variations in the skeleton and teeth of the fossil series are observed to have a definite direction; in seeking an explanation of this direction, we observe that it universally conforms to the re-actions produced in the individual by the laws of growth; we infer that these re-actions are transmitted. If the individual is the mere pendant of a chain (Galton), or upshoot from the continuous root of ancestral plasm (Weismann), we are left at present with no explanation of this well-observed definite direction. But how can this transmission take place? If, from the evident necessity of a working theory of heredity, the *onus probandi* falls upon the Lamarckian,—if it be demonstrated that this transmission does not take place,—then we are driven to the necessity of postulating some as yet unknown factor in evolution to explain these purposive or directive laws in variation, for, in this field at least, the old view of the random introduction and selection of new characters must be abandoned, not only upon theoretical grounds, but upon actual observation.

Reading between the lines of Weismann's deeply interesting essays, it is evident that he himself is coming to this conclusion.

HENRY FAIRFIELD OSBORN.

AMERICAN ARCHIVES IN SEVILLE.¹

If I could meet the historical students of the Johns Hopkins University or the members of the Maryland Historical Society, I am quite sure, that with the aid of a few photographs which I can find here, and with the aid of a few books to which, as a hurried traveller, I cannot here find access, their interest would be quickly excited in an account of the celebrated collection of papers pertaining to early American history which I have just visited for the second time. I am not so sure that by means of a letter I can convey the same impression; nevertheless I will try.

The Alcazar, which is to be compared with, if it does not equal, the Alhambra as a Moorish palace; the Giralda, a magnificent bell-tower, noble in size, proportions, and details, and famous as an observatory in the days of Moorish supremacy; and the Cathedral, which contains a few of the most celebrated works of Murillo,—form a group of buildings which has given renown to Seville, and has drawn the admiring gaze of architects and poets and historians from every part of the civilized world.

Under the shadow of these world-famous monuments are two edifices which, in comparison with the three greater structures, hardly arrest the notice of the sight-seeker, though they are buildings which would be noteworthy for their age and dignity in any American city. One of these contains the Columbian Library, founded by Fernando Columbus, son of the great discoverer; and the other contains original papers which pertain to the Spanish discoveries in the New World. It is of the second of these remarkable and world-famous collections that I now propose to write.

Casa Lonja is the name of the building in which are kept "The Archives of the Indies," the title by which Spain has designated from the earliest days until now the papers pertaining to her American discoveries and possessions. For a long period the authorities of this country refused to accept the name "America," and "only yielded to the majority," as a Spanish writer informs us, "when resistance was useless."

¹ Letter from President D. C. Gilman, in the Baltimore Sun of Dec. 31, 1889, written from Seville, Spain, under date of Dec. 12.

The Lonja was built nearly three hundred years ago, as a sort of merchants' exchange; and there is a trace of its original purpose in the apartments now occupied by the Chamber of Commerce. It is a massive, simple, quadrangular building, the sides of which may be two hundred feet long, and it encloses a beautiful court, in which stands a statue of Christopher Columbus. The stone of which it is partly built is of a dull-brown hue, but in other respects I was reminded of the Peabody Institute in Baltimore. There are two lofty stories, the upper one being devoted to the archives. Ascending a stately marble staircase, and passing the outer offices of the registers or secretaries, we entered a long gallery, which extends completely around three sides of the building, and must, therefore, be almost six hundred feet in length. It is not interrupted by partitions, is lofty, light, free from dust, and in excellent order.

Around the walls are cases open to the eye, in which are thousands upon thousands of packages containing original letters and reports from every part of the globe. Each package is carefully tied up, and it bears a conspicuous label, stating the district to which the papers belong and the dates to which they relate. They are separated in fourteen principal departments, corresponding with the fourteen *audiencias* into which the exterior possessions of Spain have been divided. Not yet placed upon the shelves, but stacked in the centre of the gallery, were a multitude of packages lately received from Havana.

To the casual visitor all this is impressive because of its voluminous extent. If he has any antiquarian taste, his appetite is whetted to know what these packages contain, and whether there are any papers of historical interest that have still escaped the keen eye of historical scholars. But the curiosity of the passing visitor is gratified, as it is in the British Museum, and as it is in the Lenox Library of New York, by the display under glass of some of the most interesting autographs and documents belonging to the collection. Here are papers bearing the signatures of Ferdinand and Isabella, Philip le Bel, Joanna or Crazy Jane, Charles V., and Philip II.; but to me the papers sent to these sovereigns from the New World by the great navigators and conquerors were of far more interest than royal autographs. Hanging upon the walls were portraits of many famous discoverers, doubtless authentic likenesses, though not original pictures. We seemed to be brought into the presence of these great men as we looked upon their faces and saw the lines which their pens had traced.

The newspapers of this week are filled with the splendid achievements of Stanley, whose arrival at Zanzibar is just reported, and with expressions of pity for Emin Bey, who has met with such an accident after escaping the dangers of the Mahdi, imprisonment, sickness, battle, and fatigue. These stories of the exploration of Africa are a fresh commentary on the privations and perils encountered when America was "the dark continent." In parallel columns we are reading of the exile of Dom Pedro II. and of the substitution of a republican for a monarchical government in the great territory of Brazil, last of all the countries in Spanish America to renounce the authority of a king. How obvious it is that the "archives" of to-day are books and newspapers. The telegraph in a moment reports from the lands beyond the seas events which three or four hundred years ago would not have been made known for months and years.

Here, for example, is one of the first letters which attracted our attention, from Fernando Cortez to Charles V., dated May 15, 1522, and complaining that he has had no answer to the despatches he had sent during the three years he has been in New Spain. He announces that he has discovered the South Sea, the coast of which is inhabited, and that he has begun to build ships. He begs the King to listen to the messengers whom he sends, assuring him that this business is far more important than all that pertains to the rest of the Indies. Contrast this delay in the exchange of correspondence with the telegrams which have been passed within the last week between Stanley and the King of the Belgians and the Emperor of Germany.

Another letter which interested me particularly was that of Juan Ponce de Leon, dated Feb. 10, 1521, announcing the discovery of *la isla florida*, and expressing his intention to go again and find out whether this is really an island or a part of the mainland of Velasquez.

Here was a letter from Francisco Pizarro, dated at Cuzco in 1535, in the handwriting of a secretary, who attaches the signature of the conqueror. Pizarro makes his mark on the right and left of the signature, as Spaniards now are wonted to subscribe a flourish or dash of the pen to their signatures.

I paused with special attention before the portrait of Fr. Bartol. de las Casas, in his clerical garb, and read his letter to Charles V., explaining to the Emperor, that, in addition to saving many souls, he might obtain the best income in the world from the rich lands beyond the seas if he would only adopt the measures which Las Casas proposed.

Here, too, we saw an autograph of Amerigo Vespucci, another of Bernal Diaz, one of Magellan, one of Balboa, one of Velasquez. There was also displayed in one of the cases the treaty (June 5, 1494) between Ferdinand and Isabella and the King of Portugal with regard to their respective possessions in the seas. We were also shown the bull of May 3, 1493, delivered by Pope Alexander VI.

The autograph of Christopher Columbus is not here to be seen. In the Columbian Library, near by, are some of his books, with annotations in his own handwriting, — books that have often been mentioned by the travellers who have seen them. Before leaving Baltimore, I read with great interest the account of this library given by Mr. S. Teackle Wallis in his recollections of Spain, and I will not attempt to redescribe that which he described so well. Indeed, his books ought to be reprinted, and made accessible to a new generation of readers, for they are just as good now as when they were written. Can copies be found in the New Mercantile Library or in the Hopkins Historical Rooms? If not, let some one give his copies, to be made accessible to the public.

The consul of the United States, Mr. Caldwell, introduced us to the chief of the archives, Ilmo. Sr. D. Carlos Jimenez-Placer; and this distinguished gentleman accompanied us through the halls and answered all our inquiries in the most obliging way; and, although our knowledge of Spanish was not much better than his knowledge of English, we were able through an intelligent interpreter to obtain a great deal of information.

It appears that the collection of these historical papers at Seville is due to one of the most enlightened of the modern kings of Spain, Charles III., who in 1781 issued a decree establishing in the Casa Lonja *el real archivo de Indias*. Most of the Spanish archives are still at Samancas, north of Madrid, including, doubtless, many of those which have been so serviceable to Mr. S. R. Gardiner in the preparation of his admirable history of England in the reigns of James I. and Charles I., to Froude and other recent historians.

I asked the head of the archives, Sig. D. Jimenez-Placer, whether a young man from the Johns Hopkins University, properly accredited and having a definite historical purpose, might be allowed to prosecute his inquiries in the Indian archives. He replied that such authority could only be given in Madrid, and that application should be made to the ministry of foreign affairs, properly, of course, through the American minister. In the two visits which I made to the archives I saw no signs of an investigator. I also asked for an authentic account of the archives, printed in Spanish or any other language; but I could learn of nothing more satisfactory than that which is given in the local histories and guides to Seville.

In one of the book-stores I found a copy of the "Cartas de Indias," published at Madrid in 1877 by the minister of Fomento, — a magnificent quarto volume, containing facsimiles of two letters of Columbus, and of many other important papers, illustrated with notes and essays. I looked upon the book with the envious eye of a librarian and the economical eye of a college president; but whether I shall buy it for the university or not, to-morrow will decide.

BOOK-REVIEWS.

De la Suggestion et du Somnambulisme dans leurs Rapports avec la Jurisprudence et la Médecine Légale. Par JULES LIEGOIS. Paris. 8°.

PROFESSOR LIEGOIS has in this volume presented a work destined to take an authoritative place in the modern study of hypnotism. He approaches the subject from an aspect not yet worthily represented. He is a professor in the law faculty at Nancy, and, together with Bernheim, Beaunis, and Liebault, has contributed to the position and the fame of the school of Nancy. In the present volume he brings together the result of some five years' study and observation. Though interested primarily in the legal aspects of hypnotism, and entitling the volume according to this interest, the author takes a very wide view of the subject; so that, in addition to its special purpose, the volume forms a serviceable manual of the views of the Nancy school of hypnotism.

We have first an historical survey of the phenomena beginning with Mesmer, in which special attention is paid to those who first presented the importance of suggestion as an explanation of the phenomena, and thus in some sense were predecessors of the school of Nancy. Following upon this is a chapter describing the methods of hypnotization and the various kinds and degrees of the effects produced. We come then to the real core of the subject, suggestion and its many variations. The author forcibly defends, and illustrates with an abundance of examples and *pièces justificatives*, the point of view of the school of Nancy, holding that suggestion, conscious or unconscious, is the clew to the explanation of all the phenomena, and assigning to the physical manipulations, etc., the rôle of re-enforcements of suggestion. The main body of the work is devoted to the description of all those phenomena of hypnotism likely to be concerned in criminal abuses, for which this state of automatism and unconsciousness offers facilities; and, as almost the entire range of phenomena can be so abused, the result is a rather large work.

The first class of crimes noticed are those against the person hypnotized. To make this possible, it is necessary that the subject shall be entirely insensible, and again, that, upon awakening, the subject retain no memory of what has been done. The former is conclusively shown by the many tests of pricking with pins; applying electrical shocks, irritating substances, etc., employed to show the genuineness of the phenomena; and, in addition, by the many cases in which this insensibility is utilized for performing surgical operations. A very complete account of these is given, showing how easily and how variedly this power may be abused, and no clew remain of the perpetrator of the crime. The forgetting of what has happened in hypnosis is the normal case in all but the lightest stages, and, especially if re-enforced by a direct suggestion that no trace shall remain in the memory, becomes a most serious factor in the legal aspects of hypnotism. The normal life of the individual is broken into by these hypnotic states, until at length we have almost a dual personality; the normal self knowing nothing of the hypnotic *ego*, and the latter forming successive though not continuous experiences of its own.

A second important class of crimes is inherent in the susceptibility of the subject. The automatism of the hypnotic state, placing the subject so largely at the mercy of the operator, opens out possibilities of abuse limited only by the variety of suggestions. The subject's signature may be obtained to documents of great money value; he may be induced to declare himself the perpetrator of a crime really committed by another; he may be made to accuse an innocent third party of a crime, and perhaps declare himself a witness of the fact; he may be made to commit a theft, a forgery, while hypnotized; and so on. These complications are made the more probable and the more perplexing by the existence of post-hypnotic and of retro-active hallucinations. It has been shown that almost any suggestion acted out by the subject while hypnotized may also be performed while in his normal waking condition, in obedience to a suggestion given a shorter or longer time previously in the hypnosis. Here, then, would be a person committing a crime with a full consciousness

of his surroundings, perhaps accepting the responsibility of his actions, and yet really the tool of another, irresistibly guided by a hidden hand. To show that these cases are more than fictitious, Professor Liegois devised several experiments in which subjects were made to shoot a designated individual with a paper pistol, offer him a drink of water which was believed by the subject to be poison, and the like. The retro-active hallucinations take place when the subject accepts the suggestion that a certain event has formed a part of his experience; that he has done or seen a certain thing, while in fact, though the event may be a real one, he has had no part in it. The easily impressed subject absorbs the pseudo-event into his mental possessions, may perhaps add corroborating details of his own, fixing the time, place, and circumstances. Every imaginable variety of falsification of testimony is thus made possible. This susceptibility has been observed, too, in the ordinary waking state without any hypnotization whatever, though usually only with persons subject to hypnotization. The state would then be similar to that slightly morbid condition in which fact and fiction are intermingled and an imaginative person believes his own fabrications, except that the latter are impressed upon him from without. Children are particularly liable to this weakness. The case of the boy Moritz, in the famous Tisza-Eslar affair, accusing his own father of a heinous crime, is doubtless to be accounted for in this way; and Professor Liegois cites several cases in which, in less enlightened ages, persons have been tortured and executed on the strength of evidence very probably the result of suggestion upon a susceptible temperament.

Having thus outlined the field of criminal suggestion, the author reviews a few cases of actual legal proceedings in which he feels confident that hypnotism has played a part. In some trials an abnormal condition was suspected, in others not. They are mostly, however, of no recent date, and will not command the interest attendant upon cases now occurring, in which the possibilities of hypnotism are fully understood. It is to the discussion of the methods of placing the responsibility in cases that may arise, that Professor Liegois devotes the final chapters of his volume. In the cases where the subject is the victim of a crime, it will usually be known whether he or she has been accustomed to be hypnotized, and by whom; in other words, the case would present the same difficulties as the detection of guilt in an assault in which the victim is rendered helpless by physical means. In cases in which the hypnotized subject commits a crime, the hypnotizer alone is responsible; and the proof of acting while in an irresponsible condition will clear the alleged criminal, as in a plea of insanity. If the crime is committed post-hypnotically, the proof would be more difficult, though in both cases it would have to be shown that the defendant can be hypnotized to a degree of forgetting all that happens in the hypnotic state. The right of a court to hypnotize a person in order to ascertain what has occurred in a former hypnosis (but which remains totally forgotten in the normal state) the author seems to regard as a dangerous precedent. The main point, however, is to discover the author of a suggestion, when the latter has taken the precaution to suggest to his subject complete amnesia of himself, and a full acceptance of the deed as his or her own. This difficulty Professor Liegois thinks he has solved by a series of ingenious tests. It is quite true, that, under the conditions described, the subject will be unable to name the author of a suggestion; but if, for example, she be told that as soon as the author of the suggestion enters the room she will go to sleep or do any designated act, she will do as desired, and thus reveal the real criminal. No matter how carefully the hypnotizer may have trained his subject, the possibilities of indirectly inducing the subject to reveal the hypnotizer are so many and various that some means of detection must be available. The subject, then, while irresponsive to a direct question or appeal, will respond to a suggestion indirectly giving the desired information, provided this does not conflict with a contrary suggestion previously imposed; and the safeguard of society lies in the endless possibilities of these indirect suggestions.

Such, then, are the main points in the legal aspects of hypnotism. It will readily be understood that much of their interest

attaches to the details which the original alone can supply. To guide the reader most directly to the points of greatest interest, the author prints an exhaustive summary at the opening of each chapter. In all respects the work shows most careful preparation, and deserves the place it will doubtless find upon the shelves of all following the interesting developments of the science of hypnotism.

AMONG THE PUBLISHERS.

NUMBERS 20 and 21 of the *Modern Science Essayist* (Boston, J. H. West) contain respectively "Primitive Man," by Z. Sidney Sampson, and "The Growth of the Marriage Relation," by C. Staniland Wake.

—The Worthington Company have recently published Swinburne's "Study of Ben Jonson."

—Rand, McNally, & Co. announce for next week an unabridged edition of the journal of Marie Bashkirtseff.

—The Welch, Fracker Company have nearly ready "In Western Levant," also a new edition of "On the Wing Through Europe," two volumes of travel sketches by Francis C. Sessions, president of the Ohio Archaeological and Historical Society.

—Henry Holt & Co. will publish shortly the third and concluding volume of Fyffe's "History of Modern Europe." The new volume treats of the years 1848-78, and covers the period of European politics which led up to the Franco-Prussian war.

—D. Lothrop Company have just published "The Catholic Man," a study of the character that is developed by the many phases of our modern life, by Mrs. Lawrence Turnbull; also "Stories of New France," episodes of Canadian history, written by Miss A. M. Machar and Thomas G. Marquis.

—G. P. Putnam's Sons have ready in the Questions of the Day Series "Railway Secrecy and Trusts," by John M. Bonham; and a new edition in paper covers of Edward Bellamy's "Six to One," first published in 1878.

—The result of Prang's national flower campaign is 70 per cent of all votes for golden-rod; 16 per cent of all votes for May-flower; 14 per cent scattering for daisy, mountain laurel, dandelion, sunflower, and others.

—Mr. Walter J. Clutterbuck, one of the authors of "Three in Norway," has written an account of a voyage in the waters between Iceland, Greenland, and Spitzbergen, a region hitherto neglected. "The Skipper in Arctic Seas" will be published here at once by Longmans, Green, & Co.

—D. Appleton & Co. publish this week a little book by Dr. F. H. Rankin, on "Hygiene for Childhood," giving suggestions for the care of children after the period of infancy to the completion of puberty; and a volume entitled "Evolution of Man and Christianity," by the Rev. Howard McQueary.

—The J. B. Lippincott Company have published "The Conquest of Mexico," in the new library edition of Prescott's works; a revised edition of Dr. Agnew's work on "The Principles and Practice of Surgery," an elementary work on plane and spherical trigonometry, by Professor E. S. Crawley of the University of Pennsylvania; and a guide to Philadelphia and its surroundings.

—Macmillan & Co. have nearly ready Sir Charles Dilke's "Problems of Greater Britain," which English critics rank in importance with Bryce's "American Commonwealth." It is one of the most exhaustive accounts yet attempted of the British Empire, and written by a statesman of the first rank. It gives but passing attention to the United States, and chiefly for purposes of comparison with Canada; but about one-half of the first volume deals with North America, and the whole subject has interest for every American.

—It is announced by Messrs. Charles Scribner's Sons that they have acquired from Mr. Henry M. Stanley all the American rights for his personal narrative of the expedition for the relief of Emin Pacha. Prior to the appearance of the complete work, *Scribner's Magazine* will publish an article upon his last journey by Mr. Stanley. Readers may have noticed that Mr. Herbert

Ward, who was one of Stanley's officers, makes no mention of the expedition in the article recounting his experiences upon the Kongo, which appears in *Scribner's* for February, the fact being that Mr. Stanley has reserved the sole right to describe this most remarkable of all his African undertakings.

—Ginn & Co. announce to be published in April "The Best Elizabethan Plays," edited with an introduction by William R. Thayer. The selection comprises "The Jew of Malta," by Marlowe; "The Alchemist," by Ben Jonson; "Philaster," by Beaumont and Fletcher; "The Two Noble Kinsmen," by Fletcher and Shakspeare; and "The Duchess of Malfy," by Webster. It thus furnishes not only the best specimen of the dramatic works of each of the five Elizabethan poets who rank next to Shakspeare, but also a general view of the development of the English drama from its rise in Marlowe to its last strong expression in Webster. This volume appeals to the general reader who wishes to get, in small compass, the best products of the Elizabethan drama (exclusive of Shakspeare), and also to the students in academies or colleges who are studying this most important period of English literature. It is a work equally well adapted to the library and to the classroom.

—Funk & Wagnalls of New York announce the following books now in preparation and soon to be ready: "Wendell Phillips, the Agitator," by Carlos Martyn, to which we have referred already; "The Economics of Prohibition," by Rev. J. C. Fernald, which is an attempt to apply the principles of political economy to the subject of the liquor traffic, showing the advantage that national prohibition would secure; and "A Cyclopaedia of Temperance and Prohibition," which is to be a large work, treating every relevant topic, from the most elementary to the most advanced phase of the liquor question. It will give many brief sketches of eminent temperance workers; the latest action of the various religious denominations; the liquor status of all countries of the world; the different temperance organizations; the political parties; facts and figures relating to all kinds of intoxicants, all branches of the liquor traffic, and all kinds of attempted remedies.

—The Appalachian Mountain Club of Boston has happily utilized an opportunity afforded it by the completion of the topographical survey of Massachusetts by the United States Geological Survey in compiling a contoured map of the region about Boston from parts or the whole of half a dozen sheets of the survey. The map is in the shape of a rectangle, about thirty by twenty miles, with Boston at the right centre, extending west beyond Concord, and including the Blue Hills on the south, and Marblehead on the north, — a land area of about five hundred square miles. The presence of the harbor, with its varied islands and broken outline, renders the effect of the map a specially pleasing one. For the study of the topography and geology of the district, as well as for walks, rides, and drives, and for all the special purposes of the club, the map is invaluable. The scale is a mile to an inch, and the details of reproduction precisely those of the survey. The idea may well be copied by our other large cities; and the club is certainly to be congratulated upon its promptitude, since some of the sheets included in the map have not yet been issued by the survey.

—A praiseworthy movement is about to be set on foot by *The Ladies' Home Journal* of Philadelphia. It proposes to give to any young girl of sixteen years or over, who will send to it between now and Jan. 1, 1891, the largest number of yearly subscribers to the journal, a complete education at Vassar College, or any other American college she may select. The education offered includes every branch of study, with every expense paid, the journal agreeing to educate the girl irrespective of the time required or the expense involved. To this is also pinned a second offer, which guarantees to any girl of sixteen or over, who will secure a thousand yearly subscribers before Jan. 1, a full term of one year at Vassar or any other preferred college, with all expenses paid, thus making it possible for any number of young girls to receive free educations at the best colleges.

—The old-fashioned *Home Journal* has abandoned the unwieldy "blanket sheet," and appeared last week in the more convenient size of the modern eight-page paper; but there is no change in the tone and general style of the paper, which was established by George P. Morris and N. P. Willis nearly fifty years ago.

—A symposium on "Constructive Freethought" was begun in the New York *Truth Seeker* of Feb. 8, and will be continued through the two succeeding numbers. Among the contributors are R. G. Ingersoll, T. B. Wakeman, R. B. Westbrook (president of the American Secular Union), Parker Pillsbury, and many others.

—The next volume of the series of "Historic Towns," edited by Mr. E. H. Freeman and Mr. Hunt, will be "Winchester," by Mr. G. W. Kitchin, the Dean of Winchester, who declares that the place teems with picturesque tradition and anecdote, and thinks it the most historic of English cities. The book will be published immediately by the Longmans.

—Among the principal articles in *Belford's Magazine* for February are one by Adele M. Garrigues on the University of Michigan, one by W. A. Phillips on "The New English Invasion," and one by John McGovern on the new auditorium in Chicago. "The State and the Citizen" and "The Case of Brazil" are treated editorially.

—The remarkable weeping spruce, *Picea Breweriana*, which was discovered in the Siskiyou Mountains in 1884, is figured in *Garden and Forest* for the past week, and Professor Goodale gives an interesting study of heather in North America. Garden art in public parks is treated editorially, and there is the usual variety of matter prepared by experts in different branches of horticulture.

—On Jan. 1, 1890, was issued the first number of a monthly magazine of popular natural history for Scotland. It is intended to make it a chronicle of the work done by the different natural history societies in Scotland; and reports of their meetings, excursions, etc., as well as the more important papers read before them, will receive special attention. All communications regarding it should be addressed to the editors, care of the publisher, Mr. W. B. Robinson, 194 Sauchiehall Street and 105 New City Road, Glasgow, Scotland.

—Marion Harland has taken up the work of restoring the ruined monument marking the burial-place of Mary, the mother of Washington. The publishers of *The Home-Maker*, of which Marion Harland is the editor, offer, as their contribution to the good cause, seventy-five cents out of every annual subscription of two dollars to the magazine sent in during the next six months. Every such subscription must be accompanied by the words, "for Mary Washington monument."

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LETTERS TO THE EDITOR.

* Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith. The editor will be glad to publish any queries consonant with the character of the journal. On request, twenty copies of the number containing his communication will be furnished free to any correspondent.

Supposed Aboriginal Fish-Weirs in Naaman's Creek, near Claymont, Del.

INCORRECT and exaggerated accounts of the aboriginal remains discovered in Naaman's Creek, near its mouth, having appeared in various scientific and other journals, by which the public have been led to believe that remains of a people akin to the lake-dwellers of Europe were found in alluvial deposits at the place referred to, let me here state that the pile-dwelling theory is all bosh, and any such statements were made without my knowledge or consent. My friend, Professor Haynes of Boston, when he wrote his article on the prehistoric archaeology of North America for the "Narrative and Critical History of North America," unfortunately copied the atrociously garbled version of my letter published in the *American Antiquarian* of November, 1887, from which the false impressions referred to have arisen. In the letter which I sent to the editor of the *Antiquarian*, I never made use of the term "river-dwelling sites," nor did I suggest that the wooden stakes "once supported shelters of early man that were erected a few feet above the water." I distinctly stated that I coincided with the fisherman in his suggestion about the spot having been a fishing-place of the Indians; and luckily this portion of my account has been published correctly, as by reference to p. 364 of that magazine, for November, 1887, will more fully appear.

When I heard that Professor Haynes was preparing an account of my work carried on for the Peabody Museum, Harvard University, I wrote him a letter, calling attention to the fact that I deemed the wooden piles or stakes to be fish-weirs, enclosing him at the same time a typical collection from three spots in the creek's bed that had been found fruitful, and for the sake of convenience designated, at Professor Putnam's suggestion, stations A, B, and C, so that each implement dredged up (by hand) could be located on my note-book and working plan. For some inexplicable reason, Professor Haynes seems to have been more impressed with the *American Antiquarian's* version of the affair than my own statements, adopting as his own my suggestions of the fish-weir theory, which but re-echoes that of the fisherman who discovered the wooden stake-ends. I also requested in this letter that the proof-sheets relating to my work for the Peabody Museum be forwarded for correction; but in Professor Haynes's reply to me he states, that as the publishers wanted his manuscript immediately, a portion of it being already in press, this would be impossible. I make these remarks with no intention of attacking the statements of Professor Haynes, for whom I have the most sincere regard. I simply desire to show that he has been misled by following the *American Antiquarian's* version of the find, and suggest that I should have been consulted as to the correctness of the details given, especially in so important a work as the "Narrative and Critical History of America." Any one who will take the trouble to read p. 364 of the *American Antiquarian* will also see not only the errors that I have already corrected, but others still more ridiculous, where, after my return from France, I am quoted as again having visited "the flats in the cave at Naaman's Creek." What connection there is between a cave and the mud flats around the mouth of Naaman's Creek, I am at a loss to understand. It is evident that such statements as these are the result of either gross carelessness on the part of the editor of the *American Antiquarian*, or else may be referred to his printer.

My object in stating in my letter to the *Antiquarian* that during my visit to Europe I saw wooden specimens in archaeological collections from the Swiss lake-dwellings was because the dressing of these pile structures with stone implements recalled those

I had remarked upon the ends of wooden posts or stakes in the bed of Naaman's Creek, near its mouth (not "on the Delaware marshes," as erroneously set forth in the *American Antiquarian*). This reference to a similarity of the stone axe dressings on the wooden piles used by the lake-dwellers of Europe to those of the wooden stake-ends found in alluvial deposits at Naaman's Creek, in my opinion, has occasioned all those glowing accounts which have lately been published by enthusiastic collectors, and journalists, in regard to "Remains of an Indian City at the Mouth of Naaman's Creek," "Lake Dwellings and Villages in America," "Indian Huts in the Naaman's Creek Marshes," etc.,—most glorious accounts, indeed, in which "Keller's Lake Dwellers of Europe" has been largely drawn upon, and even added to. Let me now make another attempt to give a correct version of the work carried on at Naaman's Creek for the Peabody Museum, loath as I am to spoil the romantic ideas that have emanated from certain enthusiasts in regard to them. I shall simply here repeat a copy of my letter sent to the *American Antiquarian* several years ago (Oct. 20, 1887), allowing the readers of *Science*, and others interested in the subject, to compare this correct statement with the incorrect version already referred to.

"In 1870 a fisherman living in the village of Marcus Hook, Pennsylvania, gave me some spear and arrow heads chipped from a dense argillite, as well as other rude implements of a prehistoric people which he had found on the edge of some extensive mud flats that border Naaman's Creek, a small tributary of the Delaware River. The finder stated that while cat-fishing among the reeds and spatter docks he had noticed here and there the ends of logs or stakes protruding from the mud; that they seemed to be placed in rows (to use his own words, 'they stuck out just above the mud, were as rotten as punk, and he could see no reason why they'd been placed there by white folks; more than likely the Indians in old times usem 'em to hitch their canoes to when spearing fish, and that was the reason the darts, axes, and such like, were found around there'). A visit to the place made a few days afterward, in company with this simple-minded old fisherman, disclosed the ends of much decayed ends of stakes, or wooden structures, protruding here and there above the mud, just as he had stated, confirming what I had before heard in regard to the wooden structures from a pot-hunter, or professional reed-bird gunner, who encountered them while poling his skiff off the marsh into the creek after the water had fallen somewhat on the ebb tide. At that time (1870) I coincided in the fisherman's views about the spot having been a fishing-place of the Indians, as the finds of argillite implements seemed only to exist in the neighborhood of the wooden structures or stake-ends. More mature deliberation, based upon hand-dredging and excavation, made since my first visit (1870), only serves to confirm my opinion that they were fish-weirs.

"Professional duties did not permit me at this time (1870) to give the matter serious attention, and it was not until my return from France in 1880, whither I had gone to pursue studies at the Ecole des Beaux Arts and Ecole d'Anthropologie, that I again visited the spot on the edge of the mud flat at Naaman's Creek (the north-east side of the mud flat referred to forms a part of the banks of the creek, near its mouth), where the finds had been made. While abroad I studied, in spare moments, many archaeological collections, especially those from the Swiss lakes, and visited various prehistoric stations of Switzerland. The rude dressings of the pile-ends were in some cases evidently made with sharp stone implements, recalling the cuts I had seen on the wooden stake-ends in northern Delaware. Since 1880 I have quietly examined the spot, excavating the few wooden ends that remained, preserving several that did not fall to pieces. Careful notes were made of the dredgings and excavations. These operations were carried on at low tide. The work was conducted principally by myself, aided at times by interested friends. The results, so far (1877), seem to indicate that the ends of piles embedded in the mud, judging from the implements and other *débris* scattered around them, had once served as supports to structures intended for fish-weirs, these in all probability projecting a few feet above the water, and were no doubt interlaced with wattles, or vines, to more readily bar the passage of

fish from the creek into the river. The upper portion of these wooden structures has entirely disappeared in the long lapse of time that has ensued since they were placed there. The edge of the flats on which the stakes stood¹ was covered with about two and a half to three feet of water on the flood tide. At slack water it forms a low mud-bank slanting toward the creek. Three different stations² were located, probably all that exist, in the bed of the creek referred to. This opinion is based upon careful examinations, made within the past four years, of nearly every inch of ground in the neighborhood of the wooden stake-ends, by dredging in sections between certain points marked upon the creek's bank. The implements found in one of the stations are generally made of argillite, with a few of quartz and quartzite. Some were very rude in character, and not unlike the palæoliths found by Dr. C. C. Abbott in the Trenton gravels.³ Objects of stone and pottery rather better in finish than those at station A have been found at the two other stations, B and C.'

The remainder of my letter of November, 1887, is correct: the other portions must be read subject to the changes that this repetition may suggest, which have been copied from a duplicate letter made by me before sending it (in October, 1889) [1887? —Ed.] to the journal referred to, for publication.

A unique collection from the supposed aboriginal fish-weir sites is now at the Peabody Museum, Harvard University, where any one interested in the subject may examine them. Most of the objects presented were collected by myself and friends, whose names are attached to their specimens. Work was abandoned on the locality two years ago, careful hand-dredging having exhausted the relic-beds. Last summer the steam-dredge used in deepening the creek's bed, so that sloops might approach the brick-yard standing on its bank, uprooted the various stations, A, B, and C, completely obliterating them. A few specimens of interest were, however, secured by some of the workmen in the brick-manufactory and myself. Some of these specimens have been presented to the Peabody Museum, with letters from the donors in regard to them.

¹ These had the alluvium excavated from around them, and were photographed in place, before removal.

² The term "station" was adopted at Professor Putnam's suggestion, because certain spots in the creek's bed, several feet apart, were found to yield implements.

³ It may be well to remark, that, since this letter has been published in the *American Antiquarian*, implements of like kind have been found in the boulder clay at the brick-yard alongside of Naaman's Creek mouth. The implements that were brought up by the hand-dredge at station A may therefore have been washed out of the brick and boulder clay deposits, and scattered among the alluvial deposits in which the wooden stakes were found.

I hope this letter, giving a brief *résumé* of the finds at Naaman's Creek mouth, will cause all absurd romance in regard to pile-dwellers on the Delaware to cease. If they ever did exist, I have certainly failed to find any traces of such a people, and never upheld any such nonsensical theories. HILBORNE T. CRESSON.

Philadelphia, Feb. 6.

Oscillations of Lakes (Seiches).

THE ten-minute wave that Mr. Ledyard reports on Cazenovia Lake, N. Y., in *Science* of Feb. 7, is apparently an oscillation of the same kind as those known in Switzerland by the name of *seiches*. They have been minutely studied for Lake Geneva by Professor Forel of Morges, Switzerland, who has written many reports on his observations for the *Archives des Sciences*, about 1877-80. He regards them as wave-like oscillations, commonly uninodal, of the whole body of water in the lake, produced by external disturbance, such as an earthquake, or a change of atmospheric pressure like that occurring in thunder-storms or wind gusts. He finds that the full period of oscillation for the uninodal wave is $2l \div \sqrt{gh}$, in which l is the length of the lake, and h the depth; that is, the velocity of the wave is proportional to the square root of the depth. Sometimes the *seiche* is transverse, or from side to side, instead of longitudinal or from end to end. In Lake Geneva the longitudinal *seiche* has a full period of 73 minutes, which, for the length of 73.2 kilometres, indicates a mean depth of 114 metres. The transverse *seiche* oscillates in 10 minutes and 17 seconds, where the breadth of the lake is 13.8 kilometres, indicating a mean depth of 205 metres. These depths agree well with the results of soundings. Similar phenomena have been described for other Swiss lakes.

Very little has been said about *seiches* in this country. Professor John LeConte has called attention to the probability of their occurrence in Lake Tahoe, and predicted their periods by Forel's formula as 18 and 13 minutes (*Overland Monthly*, 1883). *Science* (May 7, 1886, p. 412) has a note on the *seiches* of Lake Ontario, as observed by Rhodes at Oswego, N. Y., indicating a period of about an hour. The lakes of central New York, near Mr. Ledyard, afford the best possible opportunity for examination in this regard. A simple self-recording apparatus to determine the oscillations of water-level could be driven by an ordinary clock; and a month's record from the end and the middle side of a lake would probably suffice to determine its *seiches* with fair accuracy.

W. M. DAVIS.

Harvard College, Feb. 10.

**I took Cold,
I took Sick,
I TOOK**

**SCOTT'S
EMULSION**

RESULT:
**I take My Meals,
I take My Rest,**
AND I AM VIGOROUS ENOUGH TO TAKE
ANYTHING I CAN LAY MY HANDS ON;
getting fat too, FOR Scott's
Emulsion of Pure Cod Liver Oil
and Hypophosphites of Lime and
Soda NOT ONLY CURED MY **Incipient
Consumption** BUT BUILT
ME UP, AND IS NOW PUTTING
FLESH ON MY BONES
AT THE RATE OF A POUND A DAY. I
TAKE IT JUST AS EASILY AS I DO MILK." SUCH
TESTIMONY IS NOTHING NEW. SCOTT'S
EMULSION IS DOING WONDERS
DAILY. TAKE NO OTHER.

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HOSPITAL REMEDIES.

What are they? There is a new departure in the treatment of disease. It consists in the collection of the specifics used by noted specialists of Europe and America, and bringing them within the reach of all. For instance, the treatment pursued by special physicians who treat indigestion, stomach and liver troubles only, was obtained and prepared. The treatment of other physicians celebrated for curing catarrh was procured, and so on till these incomparable cures now include disease of the lungs, kidneys, female weakness, rheumatism and nervous debility.

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CALENDAR OF SOCIETIES.

Anthropological Society, Washington.

Feb. 4. — Washington Matthews, Gentes of the Navajos; John G. Bourke, Gentes of the Apaches.

Biological Society, Washington.

Feb. 8. — Frank Baker, An Undescribed Muscle from the Infraclavicular Region of Man; C. D. Walcott, A New Genus and Species of Ostracod Crustacean from the Lower Cambrian; Cooper Curtice, The Moultings of the Cattle Tick; Lester F. Ward, The Flowers that bloom in the Winter-Time.

American Academy of Arts and Sciences, Boston.

Feb. 12. — Henry W. Williams, On Reconstruction of Languages.

Engineers' Club, St. Louis.

Feb. 5. — Mr. George W. Dudley read a paper on "Tests of Water-Works Engines." He explained the meaning and origin of the term "duty." He explained in detail the precautions necessary to be taken in making duty tests, in order that the results might be of value. He submitted reports in detail of two tests of compound condensing duplex direct-acting pumping-engines,—one of 3,000,000 gallons capacity per twenty-four hours, giving a duty of about 62,500,000 foot-pounds per hundred pounds of coal; the other of 5,000,000 gallons capacity, giving a duty of about 75,000,000. In the discussion, Mr. Bryan called attention to a simple rule for comparing the efficiency of pumping-engines with ordinary steam-engines, the evaporation in pounds of water per horse-power per hour being equivalent to the constant 1,980, divided by the duty expressed in millions of foot-pounds, based upon ten to one evaporation. He called attention to remarkable results that were being guaranteed by makers of compound and triple-expansion condensing-engines now being built for electric-light purposes.

Professor Johnson stated, that, if due allowance were made for engine friction, he thought the results would not be so unfavorable to pumping-engines as shown by Mr. Bryan. Professor Gale stated that pumping-engines were subject to certain losses, due to friction, for which they were given no credit. This being allowed for, the efficiency would be increased. He also showed that the cost of high-duty engines was an important item, as the increased interest and depreciation accounts might overbalance the saving. He also showed that pumping-engines were usually put in of greater capacity than required, so that they were operated under a disadvantage. Mr. Holman called attention to the relative importance of duty as compared with other items of expense in pumping water. In St. Louis the coal bill was less than half of the total cost, the items of labor and repairs being of almost equal importance. He also expressed great doubt as to the reliability of the tests of

the old Cornish pumping-engines, which were usually held up as standards.

The secretary then read for Mr. J. H. Kinealy a paper entitled "Some Mathematics on Ventilation." The author tested the commonly accepted rules of practice by mathematical deduction, with the result of showing the practice to be well founded. In the discussion Professor Gale stated that the intention of the author was to investigate what difference, if any, must be made in the provision for ventilation between a room occupied only temporarily and the same room occupied continuously.

Exchanges

[Free of charge to all, if of satisfactory character. Address N. D. C. Hodges, 47 Lafayette Place, New York.]

Correspondence and exchanges solicited with persons interested in the study of American and Mexican antiquities. L. W. Gunckel, 36 Elm St., New Haven, Conn.

I wish to exchange or purchase well-fixed or hardened vertebrate embryos for sectioning. Desire specially reptilian embryos, but will be glad to secure any material that I do not possess. Thomas G. Lee, M.D., Histological Laboratory, Yale University, New Haven, Conn.

Wanted—Books and journals, American or relating to Photography—exchange or purchase. C. W. Canfield, 1,321 Broadway, New York.

Wanted.—Marine univalves of the west coast, from U. S. line southward, and from Pacific Islands, offered; exchange from a general collection. — F. C. Browne, Framingham, Mass., Box 50.

D. E. Willard, Curator of the Museum, Albion Academy, Albion, Wis., will answer all his correspondence as soon as possible. Sickness and death in the family, with many other matters, have prevented his answering as promptly as he should have done.

I will give 100 good arrow heads for a fine pair of wild cattle horns at least two feet long. If you have shorter or other horns write me, and also how many arrow heads you want for them. I will also exchange shells, minerals and arrows. W. F. Lerch, 308 East 4th St., Davenport, Iowa.

I wish to purchase Vol. 7 of the *American Chemical Journal*, either bound or unbound. State price. Address, Wm. L. Dudley, Vanderbilt University, Nashville, Tenn.

A few duplicates of *Murex radix*, *M. ramosus*, *M. brandaris*, *Cassis rufa*, *Harpa ventricosa*, *Oliva triatula*, *O. reticularis*, *Chlorostoma funebrule*, *Cypræa caput serpentis*, *C. lynx*, *Lottia gigantea*, *Acmola patina*, *Chama spinosa*, and some thirty other species, for exchange for shells not in our collection. List on application. — Curator Museum, Polytechnic Society, Louisville, Ky.

Photographs and Stereoscopic views of Aborigines of any country, and fine landscapes, etc., wanted in exchange for minerals and fossils. — L. L. Lewis, Copenhagen, New York.

Droysen's *Algemeiner Historischer Hand-atlas* (Leipzig, 1886.) for scientific books — those published in the *International Scientific Series* preferred. — James H. Stoller, Schenectady, N.Y.

Astronomical works and reports wanted in exchange or to buy. Reports of observations on the planet Neptune and its satellite specially desired. — Edmund J. Sheridan, B.A., 295 Adelphi St., Brooklyn, N.Y.

I would like to correspond with any person having Tryon's "Structural and Systematic Conchology" to dispose of. I wish also to obtain State or U.S. Reports on Geology, Conchology, and Archæology. I will exchange classified specimens or pay cash. Also wanted a copy of MacFarlane's "Geologists' Traveling Hand-Book and Geological Railway Guide." — D. E. Willard, Curator of Museum, Albion Academy, Albion, Wis.

Morris's "British Butterflies," Morris's "Nests and Eggs of British Birds," Bree's "Birds of Europe" (all colored plates), and other natural history, in exchange for Shakesperiana; either books, pamphlets, engravings, or cuttings. — J. D. Barnett, Box 735, Stratford, Canada.

I have *Anodonta opalina* (Weatherby), and many other species of shells from the noted Koshkonong Lake and vicinity, also from Western New York, and fossils from the Marcellus shale of New York, which I would be glad to exchange for specimens of scientific value of any kind. I would also like to correspond with persons interested in the collection, sale, or exchange of Indian relics. — D. E. Willard, Albion Academy, Albion, Wis.

Will exchange "Princeton Review" for 1883, Hugh Miller's works on geology and other scientific works, for back numbers of "The Auk," "American Naturalist," or other scientific periodicals or books. Write. — J. M. Keck, Chardon, Ohio.

Shells and curiosities for marine shells, curiosities or minerals address W. F. Lerch, No. 308 East Fourth St., Davenport, Iowa.

CATARRH.

Catarrhal Deafness—Hay Fever.

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N.B.—This treatment is not a snuff or an ointment; both have been discarded by reputable physicians as injurious. A pamphlet explaining this new treatment is sent free on receipt of stamp to pay postage, by A. H. Dixon & Son, 337 and 339 West King Street, Toronto, Canada.—*Christian Advocate*.

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